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Annual

A Review of the Current Literature of
Military Science

for 1915

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The International Military Digest

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PREFACE

In placing before its readers this first annual cumulation of the INTERNATIONAL MILITARY DIGEST, the Editors feel that their efforts should be judged in the light of the many difficulties that beset any new undertaking in its period of organization. These have been augmented in this instance by the conditions brought about by the European War. Many of the standard military publications of the belligerent powers have suspended publication. a fact which was known and discounted. But the work has been further hindered by the irregularity of the foreign mails, a condition which seems to grow worse as time passes. All publications show the results of rigid censorship.

The Editors have attempted to bridge the gap thus created by presenting matter resulting from a more thorough and extended search of the non-technical periodicals than was at first anticipated. Notwithstanding the difficulties, however, the field of our exchanges is steadily widening and the material suitable for review is steadily growing in volume. It is safe to say that the contents of the DIGEST will show a steady improvement in professional value in spite of the conditions resulting from the war.

In our own land, the European War has had the effect of sharpening the interest in military affairs, and of increasing the public concern in regard to the efficiency of our military establishment. With the restoration of peace, not only will the standard military periodicals resume publications, but it is probable that many new military publications will be started, and in them will be recorded the advance in military knowledge resulting from the operations of the present war.

Obviously, it will be more difficult than ever before to keep abreast of current military literature. The major portion printed in foreign languages will not be accessible to many officers through unfamiliarity with the language or through lack of access to the periodicals themselves. Moreover, even if the difficulty of language were solved, the average officer would be overwhelmed by the mere volume of the matter available, and thus shut off from the professional lessons that have been learned and from the questions that are being discussed. Yet in some way, both for the members of the military profession and for the layman as well, means should be provided for taking accurate measure of the events and after effects of the colossal struggle now raging.

INTERNATIONAL MILITARY DIGEST has undertaken to solve for its readers the problems of volume and of language by covering the whole field and presenting the result in concise, readable, impartial and informative summaries, classified, arranged, and cross-referenced so as to be easily accessible.

Citations are given in each case directing the reader to the source of the abstract where the full text of the article may be found. The abstracts vary usually from one-fifth to one-twentieth of the length of the original article, though in some cases where the reason is obvious, title and citation only are given.

The DIGEST publishes no original articles, and aims in no sense to supplant any existing periodical. It aims only to supplement and make more valuable all of them: positively, by directing the inquirer at once to specific articles desired (often, especially when in a foreign language, liable to be inaccessible to many searchers); negatively, by enabling him, by its outline of their scope, to ignore *ab initio* articles quite out of the range of his investigations.

The DIGEST should prove a working professional tool of the greatest value. The publishers hope and believe that it will be accorded adequate professional support, without which its continuance would be impossible.

The DIGEST represents a very great amount of labor in the preparation of its subject matter. Without the assistance of the Associate Editors, this work could not be done. Much of the credit for such professional excellence as the DIGEST has shown is due to them, and the Editors-in-Chief gratefully make this acknowledgment of the value of their services.

THE EDITORS.

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A REVIEW OF THE CURRENT LITERATURE OF MILITARY SCIENCE

CUMULATED FROM THE MONTHLY ISSUES OF THE "INTERNATIONAL MILITARY DIGEST"

Main entries are indicated by BLACKFACE CAPS; subheads by lower case blackface; geographical subdivisions by *italic* center heads.

NOTE.—*The digests of articles presented herein are merely condensed statements of the original articles. The Editors assume no responsibility for the opinions or conclusions, which are those of the individual authors. Any editorial comment is enclosed in brackets* [ ].

A. E. G. HYDROAEROPLANE

—Monoplane

[The A. E. G. Monoplane Flying Boat. *Flight.* March 5, 1915. 600 words, illus.]

This machine of the pusher type, has wings slightly back-swept, with upturned tips forming hinged ailerons for lateral stability. Besides the main float, there are wing tip floats mounted flexibly on suitable outrigger booms. The main float is of the single-step type, and is divided by six bulkheads into seven watertight compartments. The engine is a 150-H.P. Benz.

ADRIANOPLE, Siege of

[The Siege of Adrianople. By Major S. C. Vestal, C. A. C. *Infantry Jour.*, July-Aug., '15. 7000 words. Map.]

Adrianople lies in a thirty-mile gap in an east-west line of mountains, which form a natural military frontier. The city lies at the junction of three rivers and has blocked invasion since historic times due to its strategic position. Turkey, at the beginning of the war, held this line. The flanks were secure, numerous safe communications by road, railway and sea could draw upon the vast resources of her Asiatic provinces. Her troops could await the enemy or could take the offensive with many natural advantages in their favor. On October 17, 1912, the date of the declaration of war, three Bulgarian armies were concentrated in southeastern Bulgaria along a 60 mile front opposite the Adrianople-Kirk Kilisse gap. Each army exceeded 75,000 men. The Bulgarian plan was (1) to surround and mask the fortress of Adrianople as quickly as possible and to make the investing army a pivot of maneuver for the other armies; (2) to attack and take Kirk Kilisse at any cost; and (3) with these latter troops plus what could be spared from (1) to seek the main Turkish army.

The plans of campaign of both forces were largely based upon the 1910 maneuvers of the Turkish Army. The Bulgarians however decided to appear to follow the 1910 scheme but to move upon Adrianople from another point than had been chosen by Von der Goltz in the maneuvers. They issued orders and actually entrained the troops but carried them beyond the assumed point. Oct. 18, one day after the declaration of war, advance troops of I and II armies were across the frontier. The III Army, secretly organized was kept back. The Bulgarians crossed the river 20 miles above the city over the only bridge and on Oct. 21, began the investment of the western and northern fronts of the fortress. Their armies pivoted on the investing army and swung toward the east. On the 22nd, despite Turkish attacks, they began to cut off the eastern exits.

Adrianople, open only on the southwest, is a thoroughly oriental city, with narrow tortuous streets and irregular wooden buildings. The population during the siege was 100,000. Generally speaking there were two lines of defense, advanced works and the main forts. A third line of old forts played no part and may be disregarded. The inner lines of communication across the three rivers, the separate hill masses with impassable river valleys between, made defense easy; the lack of bridges, the rapid current and great width of rivers, which prevented construction, swamps

ADRIANOPLE, Siege of—Continued
or inundated areas were most unfavorable to the offense. Taken all in all, the conditions for defense were ideal.

The advanced works, one or more on each front consisted of trenches and field works, at from 5000 to 13,000 yards from city—allowing artillery bombardment from the very beginning. Wire entanglements were largely though carelessly used, and in several cases were fatal to the Turks themselves.

The main line of defenses, 21 miles in perimeter, consisted of forts, batteries and trenches. The forts, some of which dated from 1829, were too prominent, offered no obstacle to infantry attack, nor cover for the defenders. 16-inch concrete was insufficient to resist the fire of the 5.9 inch guns. The trenches were generally well sited; the entanglement often lay in dead ground, and being generally continuous precluded sorties, cut off support and inaugurated a passive defense.

The northwest sector, lying between the two largest rivers, was the strongest. The forts were well chosen and grouped and could have served for a much stronger active defense. The so called forts were, however, deficient in construction, ditch defense, cover, all-round fire and obstacles. Their military value was almost nil. These defects were in great part redeemed by the well chosen infantry trenches, which constituted the whole defensive strength of this front, which held out to the last.

The east front consisted of two lines of trenches, 1000 yards apart, automatic ground mines, an inundated area, forts and batteries. The forts were old, remodeled, along a ridge running southwest at 6000 yards distance at the northern end and 1800 yards at the southern. At the north end, the ridge makes a right angle, affording an enfilading position fully made use of by the Bulgarians.

The forts averaging 1000 yards apart were badly sited, offering sharply outlined crests for hostile fire. Some dead ground existed. There was no protection from shrapnel, ditches were not fire swept and there were no obstacles. The south front was on a low rolling plateau with defenses in the folds. The forts on this line were to have been further strengthened by trenches but these were never constructed. The west front consisted of strong field works and well concealed howitzer batteries. The garrison consisted of 75,000 men with 600 guns, generally Krupps. The individual was poor. Many had never seen a rifle, and the parapet had to be shaped so as to secure a fire parallel to ground. Artillery, both field and heavy was little better. Shells burst high, or on contact, the range, once assumed correct, was rarely changed, irrespective of movements of the target. The Infantry used a 30 calibre, 5 cartridge-clip Mauser with long blade bayonet; some infantry had the Martini-Henry. The Cavalry had a 37 cal. Mauser carbine. The field artillery had the 3-inch Krupp shielded quick-firer. The machine guns consisted of 20 Maxims and 45 old Gatlings. The Infantry carried a small intrenching shovel.

The Turks used common and high explosive shells; ordinary shrapnel star shells, burning 2 to 5 seconds after burst, were also used. Horsed 4.1 inch guns, 12,000 yards range, appeared with effect at different points and were said to have done good work against aeroplanes. There were two anti-aircraft guns. The Turks fired ten rounds to the Allies one.

The fortress was well supplied with roads. A narrow gauge railway with circumferential and radial lines, and provided with 5 engines and 200 cars of various types, traversed the fortress. There were a few motor trucks. The northwest front was best supplied with communications, the east front the worst. Bridges were inadequate and the lack of such communication between the south and east fronts prevented the use of reserves against the final assault, and led to disaster. The telephone system was extensive and efficient. Field phones and a wireless communicating with Constantinople were in use. The food supplies, though abundant, were badly managed and starvation existed, with ample stores of food in the city. Early in the siege, the water supply to northeast, was cut off and river water, also puddles and pools were the only source. Hospitals were totally inadequate, wofully mismanaged and without stores.

Against Adrianople at the time of the assault the Bulgarians had 105,000 men and 342 guns; the Servians 47,000 men and 98 guns. These guns were Schneider-Creusot and Krupp. The 5.9 inch Servian howitzers, of which there were 9, were the most powerful weapons of the Allies. Ammunition was economized. Two captive balloons and 25 aeroplanes (Bulgar) furnished only 1 working balloon and 6 aeroplanes, but the reconnaissance effected was very satisfactory. Six Bulgarian 24 and 36-inch searchlights worked well. The 9 pound .2-inch steel body shields were not effective where they were needed, at the short ranges. 500 miles of duplicate telephone wire was used. The Infantry and Artillery had separate systems. Headquarters of the II Bulgarian Army was established and remained at Mustapha Pasha during the siege.

[The Siege of Adrianople. By Major S. C. Vestal, C. A. C. *Infantry Jour.*, Sept.-Oct., '15. 6800 words. Concluded.]

The Turkish armies were in full retreat by Oct. 23, leaving Adrianople to its fate. On November 5, nineteen days after the declaration of war, the investment of the city was practically complete. Adrianople contained 172,000 persons, of whom 25,000 were refugees who entered the city driving their flocks and herds. Scarcity of forage required slaughtering of these animals, but Turkish methods prevented the proper husbanding of these resources, and famine eventually ensued in spite of the immense stores of food in the city. Guns were taken from the forts and mounted in concealed positions. Ammunition was plentiful, and lavishly used. The Bulgarians, however, were very sparing and directed their fire by means of a captive balloon. Shukri Pasha, the fortress commander, was replaced by Ismail Pasha, November 5.

On the west front, the Bulgarians occupied

rifle trenches at 2200 yards range, with outposts at 1100 yards from the Turkish lines. On the northwest front, both Serbs and Bulgarians were from 6500-7000 yards from the Turks and occupied a line of redoubts, 1100 yards apart, fire trenches, communication trenches and batteries. This line, on commanding hills, was purposely kept beyond effective Turkish range since blockade only was intended. The redoubts of both besiegers were for a half company, wide and of little depth, with traverses, splinter proof casemates, observation posts, flanking machine guns, and wire entanglements. The outposts were 2200 yards in advance of the main position, were poorly concealed, narrow, not drained. and lacked latrines, stoves and bathing facilities, so that colds, typhoid, and dysentery ensued.

On the east front, a Bulgarian line at from 6600-7000 yards consisted of groups of rifle trenches on the north, and redoubts 1100-1800 yards apart on the south. Batteries placed on reverse slopes 150-200 yards in rear of the infantry showed there was no fear of premature bursts. The trenches were well sited and concealed; 1600 yards in rear of this line was a second line of redoubts and trenches, and 1600-2200 yards in front of main line was the outpost line.

Thirty siege guns were used against the west front, and 72 against the northwest front. These were well concealed, well applied to ground and entrenched. Dugouts with shrapnel proof roof of sheet iron and earth were plentifully provided. A niche at each gun contained the day's supply—20 common shell and 60 shrapnel. Nearby group magazines contained a two days' supply, and sector magazines 6600-7700 yards in rear contained 3 days' supply. Ox carts transported this ammunition from the sector to the group magazines. Fire direction was in the hands of the Artillery Commander of the Siege Armies, through regimental and group commanders by means of an efficient system of telephones.

During November, the Allies were engaged in closing in with their artillery on the northwest sector to about 2000 yards. A daily bombardment of seven days did little damage. since projectiles passed through houses and into soft ground before exploding.

A two month's armistice began Dec. 4, which was fully utilized by the Bulgarians, and not at all by the Turks. Tobacco and meat were plentiful, but bread was scarce.

The political situation in the Balkans demanded the capture of the fortress. The east front was selected for attack for the following reasons: the taking of the northwest front required the capture of the very strong position of Papas Tepe, which had already twice repulsed Bulgarian attacks; the troops on this front were Serbs, and it was impossible to impose the main task on them in an enterprise which was for the special benefit of the Bulgars; the Turks placed great confidence in the east front, and therefore their vigilance was relaxed. This was known to the Bulgarians, through their excellent secret service. Therefore it was decided to assault the east front, with strong secondary attacks upon the south and northwest fronts.

Upon this decision, the transfer of the artillery to the east front was begun, and the infantry on the west, northwest, and east fronts was moved up to the outpost lines. This was during the armistice, and was vigorously protested by Shukri Pasha. The transfer of artillery required two months.

Bombardments, attacks, and aerial reconnaissances took place frequently during the period from the resumption of hostilities on Feb 3 to March 22. Severe cold, heavy snows, and lack of fuel caused suffering to both belligerents. Want began to press upon the besieged.

Heavy reinforcements for the allies hastened the final assault. The lines, the Serbian especially on the west front showing good engineering work, in general were closed in on the city; on the northwest the original positions were now rear positions. All batteries were echeloned and were intrenched to the height of the shields, with shelters behind for ammunition wagons, and communication trenches to the guns. Many of the communication trenches in the second line on the reverse slopes were wide and deep enough to allow passage of ammunition wagons.

The Bulgarian rifle trenches on the east front were in many cases too near the military crest, and were visible at a long distance. Though liberally fitted with shrapnel and splinter proof covering, they were not proof against the 3 in. common shell. On the reverse slopes however, good protection against all kinds of shell was provided. All troops were exercised in the construction of model redoubts, in demolitions, and in crossing obstacles. Though the latter drill had a demoralizing effect, the practice gained was of immense benefit in the attack on the east front.

Ninety-eight siege guns in three groups operated against the city from the east front. All artillery fire was under the direction of one man. Great secrecy was observed in all preparations, and the attack on the east front was an overwhelming surprise to the Turks.

All field and siege guns were ordered to begin the artillery preparation on March 23. Infantry attacks were to follow on the nights of the 23rd and 24th.

The siege guns on the east front opened with the others, but soon ceased fire in order to conceal the direction of the attack. The attacks on other fronts were made with varying successes, and at 3:30 a. m., March 24th, the infantry on the east front moved forward. By 7 a. m. the excellent artillery fire had silenced all Turkish batteries on the east front, and had demoralized the enemy infantry. The moment was favorable for attack, but the Bulgarian infantry was in disorder, the reserves were far distant, and a fog had arisen which concealed all landmarks, but which allowed the Bulgarians to work slowly forward and entrench. The fire fight was continued all day on all points. At 2 a. m., Mar. 25, the entanglements having been cut at many places so as to make narrow passages, the final attack began. A flank attack by a part of an infantry regi-

ADRIANOPLE—Continued

ment gradually increased until the whole line was engaged. The inevitable was foreseen, several magazines in the city were blown up, and everything possible ordered destroyed. At 9:30 a. m., a cavalry brigade entered the city, followed by the 23rd infantry with its band. By 2:30 p. m., all fronts were silent, and Shukri Pasha surrendered. The Turks lost 15,000 killed and wounded during the siege, and surrendered 60,000 prisoners, 14 pashas, 2000 officers, 600 guns, 20 motor trucks, and great quantities of provisions and munitions.

Adrianople is one of the few fortresses to be taken by assault up to 1914. Had the Japanese used the Bulgar plan, they would have taken Port Arthur at much less cost.

Works of a purely field type would have protected Adrianople better than her permanent system of defenses, as witness the line of trenches in Europe to-day and the fall of Liége, Namur, and Antwerp.

True the Turkish garrison did not know how to construct field works and remained idle in garrison for five months, but the inference is irresistible that the presence of permanent fortifications was the direct cause of the fall of the fortress.

The supplying of ammunition to the besieging artillery was good but was not subject to the severe test that broke down the Russian system at Port Arthur. The separate telephone system for artillery and infantry was a great improvement over the single system at Port Arthur. Night operations were of great value and had been practised prior to the war. It was a mistake to allow refugees to enter the city. Above all stands the great need of a very determined fortress commander, strong technically as well as morally. Such are really rarer than good field commanders.

ADVANCE GUARD

[The Confusion of Tongues in the Matter of Advance Guards. By Capt. Ubaldo Soddu. *Riv. Mil. Italiana*, June, '15. 4000 words.]

The Italian regulations for the employment of the three arms in combat, issued in 1891, met the needs of the times, but the progress of military art and the teachings of war made it necessary to issue new regulations, which was done in 1903. These latter gave much liberty of action to commanders of units in the choice of means to accomplish their tasks. But from this time began that uncertainty as to the strength, composition, and duties of advance guards, which has led to continual changes of the regulations on this subject and a resulting lack of simplicity and clearness.

History has many examples of difficulties brought on by advance guards that failed to carry out their instructions. In some cases their action may be accounted for by the development of unforeseen situations; in others, the advance guard commander has failed to enter into the spirit of the plans of the army commander.

The duty of the advance guard is to protect the main body from surprise and give its commander time to decide whether to avoid or accept combat, but the successive editions of the regulations have sanctioned various obscure and contradictory theories as to how the advance guard must act in performing its duty.

The elements that determine the strength and composition of the advance guard and its distance from the main body, are the terrain, the purpose of the march, and the information regarding the enemy. The regulations of 1903 and 1910 give the strength as ¼ to 1/6 of the entire strength of the column; those of 1913 give ¼ to 1/9. An advance guard should have artillery, as a general rule, but this should depend upon the nature of the ground and the size of the advance guard. However, the regulations have not brought out clearly the conditions that govern in this regard.

The regulations of 1910 were permeated with prudence, requiring the advance guard to avoid hostilities unless superior to the enemy in numbers. Those of 1913 are filled with vague and poetic abstrusities, entirely unsuited to the guidance of the advance guard commander, whose task requires energy and vigor and is essentially offensive.

The gigantic war now raging among almost all the nations of Europe has not destroyed the value of all the past teachings on military art. It has brought many changes, but the human element still holds the preponderance. There will still be advance guard actions, both at the opening of hostilities and during the campaign. They will not be brilliant and rapid, after the manner of Von der Goltz, but will be desperate struggles, with enormous losses. They will always be offensive: in the beginning of hostilities to thwart the initiative of the enemy; in the later stages, to prepare the way for violent action on a large scale.

—Action

See also
HSIAO-SI-ERH, ENGAGEMENT AT

AERIAL TORPEDOES

See
TORPEDOES—AERIAL

AERO-ARROWS

See
"FLECHETTES"

AERONAUTICS

[*Note, for a rapid survey of the material under* AERONAUTICS, *that it is distributed on the pages indicated under the following geographical and subject subheads:*

Note also for much other valuable material on AERONAUTICS *the cross-references, not only after the General material under this head, but also after the material under many of the* AERONAUTICS *subheads.*]

[Progress in Aeronautics. Major H. Bannerman Phillips. *United Service Magazine.* Jan 15. 6000 words.]

The tribute paid by Sir John French to the usefulness of the aeroplane in the campaign in France is hailed as insuring an immediate impulse to the aircraft industry of England, and its establishment upon a solid basis.

"The work performed by the Royal Flying Corps has continued to prove of the utmost value to the success of the operations," says Sir John in his despatch of Nov. 20 * * * "The development of their use and employment has indeed been quite extraordinary, and I feel sure that no effort should be spared to increase their numbers and perfect their equipment and efficiency."

The daring raid of three British aeroplanes on the Zeppelin factory at Friedrichshafen is reported to have resulted in the destruction of the gasworks, and the serious damaging of one Zeppelin. The machines were of British design, being 80 h.p. Gnome-engined Avro biplanes, built in Manchester. Incidentally, the raid has brought into prominence a vexed question of international law. As the British airmen had passed over certain portions of Swiss territory, the Swiss Government protested that its neutrality had been violated by this invasion of Swiss air. In reply, the British Note stated that the aviators had had formal instructions not to fly over Swiss territory, and that their having done so must be attributed to accident and the difficulty of recognizing their position at a great height. The Note proceeds: * * * "The British Government expresses its deep regret," but "takes this opportunity of stating that the orders given to the aviators and the expression of regret are not to be interpreted as a recognition by the British Government of the existence of a sovereignty of the air."

As to the serviceability of the aeroplane in winter, observers are quoted as testifying to the clearness with which troops, trenches, etc. are outlined against a background of snow. Wind is scarcely more troublesome than in summer; cold, though it increases the rigor of the work and may lead to engine troubles, is not an insuperable obstacle; daylight hours are shortened, but darkness is not necessarily a drawback to aerial navigation. In short, nothing less than a big storm can keep the aviators from doing their work.

In regard to air-ships, it is maintained that the true function of the dirigible is to operate, not over the land, where it is vulnerable to anti-aircraft guns and can expect only the "moral effect" due to dropping bombs, but as a sea-scout. With the great air endurance of the Zeppelins, (about 40 hours) and given clear weather, they should be able in this capacity to cover effectively large areas of sea.

The question is raised as to the permanence of the hydro-plane, with its cumbersome attached floats. Will not this additional load disappear when the craft have attained an air endurance of say 50 hours? And may not this be facilitated by the development of an aeroplane "mother-ship," with launching and alighting platforms?

The "flechette," or steel dart, used by the French airmen, is described; about 5 inches long and weighing less than an ounce, it will kill or seriously wound a man or horse when dropped from as low an altitude as 600 feet. Several thousand of these missiles can be carried in an ordinary military aeroplane.

[Progress in Aeronautics. By Maj. H. Bannerman-Phillips. *United Service Mag.* Feb. '15. 4500 words.]

The aeroplane has demonstrated its great value as an aid to the gunner. Before the war, it was the policy of the French Minister of War that each battery of artillery should have its own avion. This, however, has not yet been realized. At present, each army corps has a certain number of squadrons of aeroplanes as a part of its organization. The aeroplane is a necessary complement of the artillery for discovering the exact position of the enemy's guns. The artillery commander should have under him his own aeroplanes so that they could be used at the proper moment without delay. With the available aeroplanes under the orders of the corps commander, the request of the artillery commander for the use of them has to be transmitted usually a distance of twenty miles, and two or three hours elapse before the aeroplanes are at their new work of observing for the artillery. The scheme of distributing to each artillery commander his own quota of aeroplanes has the approval of practically all artillery officers. This distribution could be accomplished without disorganizing any of the aeronautic services.

In the combined sea and air raid of Dec 25, none of the British cruisers was damaged by the bombs dropped by the German Zeppelins. However, their work suggested a means of protection against German naval raids on the English coast. A half dozen rigid dirigibles stationed within striking distance of the coast would be a great aid to the coast defense forces. They would be invaluable for observation, and in pursuing the enemy would

AERONAUTICS—Continued

not be subject to danger from mines strewn in the wake of their ships. Such air-ships at a height of 3000 feet and with a speed of 45 miles per hour could observe a large area and send wireless messages 150 miles to British war vessels. They could also operate at low altitudes with trawlers in mine sweeping. Their carrying capacity would be sufficient for fuel for a voyage to the German coast and return, besides carrying enough explosive to do damage to an object of military importance. Oversea possibilities have yet to be tested, but judging from the progress in this respect with aeroplanes, the immediate future may have some surprises in store.

[The War in the Sky. By Aide-de-Camp Xavier Sager, Special Correspondent of the *Scientific American*. *Jour. Military Service Inst. U. S.*, Jan-Feb '15. 1500 words.]

Though the public is impressed by aerial exploits the value of air craft on the offensive is small, and their real worth is in reconnaissance. But their importance is limited even for this purpose, as it is very difficult to get exact information of troops while flying at a great height.

The aeroplane has proven its worth against the dirigible, due to superior speed enabling it to attack with bombs from above, and in a fight between aeroplanes superior speed sometimes counts, though while making an escape the machine in front is at a great disadvantage.

For dropping bombs on troops and buildings the dirigible is superior, except that its greater bulk and extreme vulnerability make it an easy target.

Aeroplanes flying 75 miles an hour and describing irregular curves are almost impossible to hit, and by flying over an enemy's line can frequently render valuable assistance in directing artillery fire.

In a fight between aeroplanes almost invariably there is no escape for one or the other of the adversaries, and a duel high above the lines, described in the article, indicates the terrible nature of such a combat.

Data are given to show that dirigibles are not nearly so valuable as many have represented. They carry bombs loaded generally with picric acid.

Bombs carried by aeroplanes are variously loaded, but mostly with round balls, and the explosion, on impact, throws out dense smoke. They are assembled like arrows, having a triangular feather of steel, with practically the whole weight in the head. They are usually suspended by a string, which is cut at the desired moment. Aiming devices have not yet reached the perfection necessary for accurate launching.

[The Aeroplane in Warfare. By Charles Lincoln Freeston, Founder Member of the Royal Aero Club of Great Britain and Ireland. *Scribner's Magazine*, July, '15. 4000 words. Illus.]

At the time of the Morocco crisis, the French maneuvres had just disclosed the number and effectiveness of the aeroplane equipment of the French army. This was at once reported to Berlin. The German aeroplane service was at that time negligible, and the remarkable preponderance of the French service might have been an important factor had war occurred at that time.

A flight of 230 miles from England to Düsseldorf in 3 hr. 10 min. served to awaken Great Britain to the aerial situation, and stimulated development, not, however, to a point commensurate with the requirements of the present war. At the outset of operations, however, British aviators saved Gen. French's Expeditionary Force from extinction by warning him of the situation, a service which Gen. French acknowledged in his reports.

Flights have been made in this war under severe conditions. Reconnaissances in ninety-mile-an-hour gales have been officially recorded. A flight was made across the Channel in 12 minutes, and one from Farnborough (Hampshire) to Gen. French's headquarters in an hour and a half.

The extent of the aerial work may be judged by the fact that up to the end of January the French aviators had made 10,000 reconnaissances, involving 18,000 hours of flight and covering 1,125,000 miles.

The British aerial service, both military and naval, has been remarkably free from failures of men or machines. The casualties from accident or enemy's artillery have not exceeded 3 per cent. The French mention, however, severe losses among their airmen. The difference is attributable, not to the different character of the service required, but to the fact that the French machines were inferior, and the pilots less well trained. This latter condition existed at the beginning of the war and has since been remedied.

The safety of aerial work has been materially increased by the discovery that an aeroplane can descend and land safely without the use of its engine. Furthermore, to bring an aeroplane to earth it is necessary to kill or seriously wound the pilot or to damage the machine in some vital part. Time and again machines have descended safely with their planes honeycombed by bullets.

Rifle fire has proved ineffective, but the fire of anti-aircraft guns is more serious. The Germans group these guns so as to give volume of fire to compensate for inaccuracy. Even so, the aviator has a good chance of escape by maneuvering. The aeroplane is comparatively safe above 6000 feet.

No details have been given out concerning the composition of the British flying service. In March, the total number of aeroplanes in the military and naval services was about 200. Since then this number has been considerably augmented. The government factory type BE2 is preferred, but the output is not large, and the types in service were and are still varied. Production has been hampered by numerous alterations in design made from headquarters.

The monoplane is out of favor, being slower and less stable than the biplane, but the exigencies of the service have required its con-

tinued use. The Avro biplane 80-h.p. Gnome motor, speed 84 miles per hour, slow speed of 30 miles per hour, and able to land at 20 miles, is a very efficient machine. Three of these machines made the flight from Belfort to Friedrichshafen and return. One pilot was wounded and taken prisoner. The other two returned and landed within 250 yards of the point of departure after a 240-mile flight in wintry weather.

The speediest type is the "baby" or "tabloid" scout type—biplanes with small wings, capable of 90 to 100 miles per hour, with a slow speed of 40.

The principal British types of aeroplanes are the Bristol, Short, BE2, Sopwith, Avro, Dr. Havilland, Blackburn and Handasyde. The engines: Gnome, Renault, Austro-Daimler, Rolls-Royce, and Arrot-Johnston, are of foreign type, manufactured in England, the only exception being the Green engine.

In France, the most prominent types are the Voisin, Caudron, Henri and Maurice Farman (new type) biplanes, and the Morane monoplane. The new Voisin with 200 h. p. engine is a large and powerful machine.

The Germans had a large aeroplane equipment, probably 1500 in number with 600 to 700 pilots. The machines were of various types—Taube monoplanes and biplanes, Albatross monoplane and biplane, Aviatik, D. F. W. and L. V. G. biplanes. The motors were the Benz and the Mercedes, the last the best produced for duration and reliabilitv of flight. The best work of the German aviators was in warning Gen. Von Kluck of his danger at the Marne. The Austrian aerial service helped prolong the suspense at Przemysl by locating the Russian guns.

The primary duty of the aviator is reconnaissance—locating troops or artillery positions, and directing artillery fire,—and to oppose the enemy aircraft in their effort to do the same work. The methods of repelling aerial attack depend on the types of machines used. The effort is to reach such a position that fire may be delivered without being subject to return fire.

See also

A. E. G. Hydroaeroplane
Anti-aircraft artillery
Balloons
Bleriot aeroplane
Bombs—Aerial
Clement-Bayard aeroplane
Coast defence—Use of aeroplane in
Dirigibles
Field artillery—Defense against aircraft
Field artillery—Fire control—Aeronautic
"Flechettes"
Hangars
Heinrich aeroplane
Hydroaeroplanes
Hydrogen—Production of—For balloons
Kite balloons
Mann aeroplane
Nieuport aeroplane
Parisano "paraplane"
Torpedoes—Aerial

Argentina

[Our Military Aviation School. *Revista Militar, Argentine Republic,* Apr '15. 1000 words.]

Everyone knows the relative poverty of our landscape with respect to points of orientation. The country is of enormous extent and the towns widely separated. Consequently, our Aviation School has been conducting some practice flights, dispensing entirely with orientation by towns. These flights lasted about 15½ hours and broke the South American records for distance, duration and speed.

During the autumn maneuvers of 1914, 4 machines flew for a total of more than 30 hours, without any difficulty. Important experiments were conducted in observing the effects of artillery fire, which used to be particularly difficult, on account of the vast areas under cultivation; also in dropping bombs.

The trial flights for the past year reached the significant total of 35,130 km., with 9 machines.

Four new aeroplanes were constructed in the school shops.

France

[Military Service Rapidly Wears Out Aeroplanes. Anonymous. *World's Advance,* Apr '15. 250 words.]

Aeroplane motors in lots of 100 cost $3000 each. Their running life is 350 hours, and they must be thoroughly overhauled every 50 hours in use. One factory near Paris is delivering 150 aeroplane motors a month. It is assumed that 5 to 10 aeroplanes are put out of action each day. Military aviation schools are training many hundreds of young aviators, and factories are running day and night to increase the supply of aeroplanes.

[Aeronautics. Huge French Triplanes for Offensive Operations. *Scientific American,* Nov. 13, '15. 200 words.]

The French have developed a new bombing aeroplane. It is a triplane of 70 feet spread, and the three planes rise to a height of 20 feet. The crew is ordinarily two pilots, two observers, and two gunners, but twelve men can be carried. Four 37 mm. guns are carried. The speed is above 80 mi. per hour, indicating engines of at least 300 h.p.

Germany

[Types of German Aircraft. *Flying.* Mar 1915.]

A table, reproduced from *Aerophile,* the organ of the Aero Club of France, of the 35 principal types of German aeroplanes, with statistical data relating to horse power, seating capacity, fuel capacity, speed, etc., etc.]

[The New "Battle-Aeroplane" of the Germans. *Sphere,* Aug 28, '15. 200 words. Illustrated.]

The latest aircraft creation of Germany is from 80 to 100 foot spread and driven by two 100 to 150 h.p. Mercédès engines. These machines remain aloft six hours on patrol duty at an altitude of 8000-9000 ft. Each has a pilot, two gunners and two machine guns able to

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fire in any direction. The machine is modeled after the Italian Caproni machine. In this machine the Germans have challenged the aerial supremacy of the Allies, being speedier and more powerful than any they have.

[The War in Europe. NOTE.—*Army and Navy Jour.*, Sept. 11, '15. 100 words].

Despatches from Germany describe a new biplane 42½ meters spread, with 3 propellers and 300 h. p. motors. The crew is 8 men, and the biplane is to carry twelve 22-lb. bombs and 5 machine guns. Eight hours' fuel supply is carried. The biplane is reported to be now under test.

Great Britain

[The Bristol Military Biplane. *Aeronautics*, Apr 30, '15. 250 words, diags.]

A tractor biplane, 9.05 m long, span 11.3 m; motor Gnome 80 h.p.; speed, 100 k.p.h. The bomb dropping device consists of a rotating barrel carrying 12 bombs, which can be fired in succession. A strong spring gives each bomb a forward impulse. The (Coanda) bomb itself is fusiform, fitted with a propeller, and a firing device, automatically unlocked by the propeller after a travel of 200 m.

[Aircraft Fund. *Weekly Edition London Times*, June 4, '15. 1000 words.]

A fund is being collected from oversea residents for the purchase of aircraft. The need for an almost unlimited number of aeroplanes is urgent. The latest type Royal Aircraft Factory 70 h. p. biplane costs $7500, and a 100 h. p. Gnome gun biplane complete with gun costs $11,000. Subscriptions to date aggregate about $38,000.

Italy

[Italy's Air Fleet. By Ladislas d'Orcy. *Flying*, June, '15. 1000 words. Tables.]

The aeroplane fleet was completely reorganized in 1914; types are reduced to four, one national, three foreign. This fleet consists of 15 land- and 2 sea-squadrons. The land squadrons are made up partly of armed scouts, and partly of "gun-spotters." A special plane is the Caproni "bombardier"; a pusher biplane of 68 feet span, this nicked-armored machine carries a 1-inch r.f. gun, is fitted with 3 Gnome motors of 100 h.p., and does 125 k.p.h. This machine climbs 6000 feet in 3 minutes, and can keep the air for 25 hours, with a useful load of 500 k.g.

[Italy—Her Air Fleet. *Información Militar del Extranjero*, Madrid, June, '15. 650 words.]

On the outbreak of the European war, Italy had 200 aeroplanes organized in 28 squadrons. They were of two distinct classes, light and heavy—the first of French, English and Italian models, and the second all Italian.

The navy is also well supplied with hydroplanes of the Curtiss and Borel types.

The government also had, in August, 1914, four dirigibles of 420,000 cubic feet, with two motors each, of 250 horsepower, with a speed of 44 miles an hour, and capable of rising to 7000 feet; and two Parsevals of 350,000 cubic feet, each with two motors of 180 horsepower.

Japan

[An Unprecedented Flight. Editorial. *Heiji Zasshi*, Mar 15, '15. 50 words.]

Four Japanese aeroplanes flew from Tokorozawa to Osaka recently, a flight of about 50 miles. This was unprecedented in Japan.

United States

[U S. Army Aeronautics. *Flying*. Jan., '15. 3300 words.]

(Repriht of Chief Signal Officer's Report for 1914—continued from December number.)

[Naval Aeronautics. *Flying*. Jan, '15. 3000 words.]

The question of developing naval aeronautics having come up in Congress, the Secretary of the Navy announced to the House Naval Committee that all attempts to get a good type of machine have failed. He declared, further, that a successful aeroplane would have to be built by the Navy. This country is admittedly far behind all other considerable nations in aerial development; both services have in all only 23 aeroplanes, as compared with 1400 each in Great Britain and Germany, 1000 in Russia, 900 in France, etc. The General Board recommends that Congress be asked to appropriate $5,000,000 to be immediately available for establishing an efficient air service. The Secretary is of the opinion that if he had $5,000,000 he could not spend it. The situation is a serious one, since it is amply demonstrated by the present war in Europe that no military arm is complete which lacks aircraft.

[Aeronautics in Congress. *Flying*. Mar., '15. 13,500 words.]

Congress has appropriated to the Army and Navy, respectively, $300,000 and $500,000 for the development of aeronautics.

Compared with foreign budgets, these sums are almost insignificant. The two services together have only twelve aeroplanes in good condition. The Canal, the Philippines and Hawaii have no aerial protection. The Army has only one flying boat for coast defense and only one aeronautical center. The Naval so-called aviation station at Pensacola consists of nothing but a few canvas tents on the beach. Neither the Army nor Navy have so far been able to assemble the necessary personnel and material to form even a single aviation squadron, the smallest unit of aeronautical organization. In spite of the neglect from which this branch of national defense is suffering, American military aviators are second to none in general efficiency, but they are too few in number. The Army aviators, nevertheless, in 1914 made nearly 4000 flights and carried approximately 1000 passengers; those of the Navy at Vera Cruz gave evidence of their skill and ability by using flying boats and hydroplanes in reconnoitering over mountainous land. The Army aviators were not allowed to participate. [The article reprints the House debate on that part of the bill making appropriations for the Army Aeronautical Service.]

[Navy Awards Three Orders. *Aeronautics*, Apr 30, '15. 300 words.]

The Burgess Company have received a contract for 3 hydroaeroplanes, under recent appropriations by Congress. The Navy calls for 80 m. p. h., climbing power of 6500 ft. in 20 minutes, and a radius of action of at least 7 hours.

[Military Aviation. *Army & Navy Register* May 15, 1915. 160 words.]

Eight Curtiss aeroplanes are nearly ready for delivery. One of these has been sent to the Aviation School, San Diego, for thorough test. The advisory committee on aeronautics, has not yet effected its permanent organization.

[Subscription for Military Aviation. *Army & Navy Jour.*, May 29, 1915. 500 words.]

Congress having failed to make adequate provision for the aeronautical needs of the army and navy, the governors of the Aero Club of America are attempting to secure money by public subscription to supply the needs. The movement has the approval of the militia commanders of many states. Germany raised $1,800,000 and France $1,220,000 by public subscription in 1912. Germany used these funds to train aviation pilots and encourage the general development of aviation. A subsidy of $2000 for each pilot trained and machine furnished resulted in an increase from 230 pilots at the end of 1912 to 600 a year later, and an increase from 20 to 50 in aeroplane constructors. The French used their funds to purchase aeroplanes, a total of 209 being purchased.

[Are We to Remain a Minor Air Power? *Aeronautics*, June 30, '15. 750 words.]

Comdr. Thomas D. Parker, U. S. N., in the May-June *Proceedings of the Naval Inst.* calls attention to the sluggishness of public opinion in the United States in the matter of aeronautical defense, and says it is time the problem of aircraft should be injected into the strategical and war-game problems in the Naval War College. The air navies of France and Germany outnumber ours about sixty to one. Two hundred aeroplanes should be taken as the absolute minimum.

The suggested program of forty-eight aeroplanes and one dirigible is about all that can be attempted, but even that will leave us behind France and Germany for twenty-eight years. One hundred planes and four dirigibles per year are recommended, at an increased budget of $2,100,000, or about one-fourth the cost of a battleship. The personnel will be easily found, both from the younger officers and from the enlisted men—but an increase must be obtained, as the navy is already short.

Aircraft bombs are a serious menace to certain structures. Riley Scott, the inventor of a bomb-throwing apparatus, stated to the Military Committee of the House in Aug. 1913, that a flock of aeroplanes dropping bombs successively on the locks of the Panama Canal would disable them in one or two hours; and that slides could be caused by bombs in Culebra Cut. Our best defense against aircraft is a fleet of such vessels of our own, permanently based on the Isthmus.

Both planes and dirigibles are needed. France built only planes at first and soon found she needed the dirigibles. We must take the lessons of the great war and quickly take advantage of them; and by so doing we may yet find our place as an air power.

[Aeronautical Reserve Plans. *Army & Navy Jour.*, July 3, '15. 600 words.]

The War and Navy Department plans for 15 aviation squadrons for the National Guard and 22 squadrons for the Naval Militia have been communicated to the Aero Club of America.

The Navy Department offers to loan aeroplanes to the Naval Militia on a basis of two aeroplanes for a complete section of not less than four officers and twelve men, and one aeroplane for any number less than this. Realization of this plan awaits the formation of a volunteer corps.

The Aeronautical Department of the Navy urges that public subscriptions to provide aeroplanes be encouraged. This movement has already provided three flying boats and two biplanes for the Naval Militia, and the use of five biplanes for the National Guard.

War Department plans call for an aero squadron in New York, Pennsylvania, Illinois, and Texas, to be eventually increased to one squadron for each tactical division—fifteen in all. An aero squadron comprises 21 officers and 93 enlisted men, operating eight aeroplanes. Volunteers of proper qualification are urgently needed.

[Organizing Aviation Corps for the Militia. By Henry Woodhouse. *Flying*, July '15. 5000 words.]

The plan of supplying the militia with aeroplanes is being realized. Flying boats have been presented to the Illinois naval reserve, and to the New York naval militia, and areoplanes have been offered by N. Y., Pa., N. J., and Okla. Other states approve, but have no means to meet necessary expenses. Volunteer aviators may be used at joint regular and militia camps.

And it is believed that opportunities for aerial activities will be furnished at the cavalry and field artillery camps. The Navy offers to lend aeroplanes, and to train officers and men of the naval militia, under conditions and recommendations which are given in full. And it is believed that the next Congress will make provision for the aeronautical division of the naval militia. The War Department plans call for the maintenance of an aero squadron of organized militia in N. Y., Pa., Ill., and Texas, but nothing can be done to carry them out until Congress makes the necessary appropriations.

[Plans of National Advisory Committee approved by President Wilson. *Flying*, July '15. 1100 words.]

Publishes the rules and regulations for the

AERONAUTICS—Continued

conduct of the work of the National Advisory Committee for Aeronautics. The President of the Committee is the Chief Signal Officer, U. S. A., and the secretary, Naval Constructor Richardson, U. S N.

[Note. *Army and Navy Jour.*, Aug. 14, '15. 250 words.]

By a decision of the Comptroller of the Treasury the Naval Advisory Committee for Aeronautics will have $10,000 available for the year ending June 30, 1916. The committee is preparing for an extensive investigation of aeronautics, and will submit a report to Congress.

[Mr. Emerson McMillin offers $50,000 to Increase Aeroplane Fund to $500,000. *Aerial Age*, Aug. 16, '15. 1200 words.]

(Note.—After discussing the above offer, certain defects in our equipment are pointed out as follows):

The U. S. Army, the first to have an aviation section in 1912, has now only five aeroplanes in commission and five ordered. The half dozen navy aviators have never maneuvered with a fleet and do not know what ships and submarines look like from the air.

The Army has about a half dozen more aeroplanes than the Navy, but the Army aviators have never had practice in operating with troops. Our army has never practiced firing with aviators as spotters. Neither coast has any aeroplanes for its defenses, nor have the Philippines, Hawaii, or the Panama Canal. The National Guard and Naval Militia have had no experience with aeroplanes. The Aero Club of America sent aviators to the maneuver camps of the National Guard in New York, Penn., and Vermont.

[Aerial Needs of the Army. Editorial. *Arms and the Man*, Aug. 19, '15. 250 words.]

Contrary to the average man's opinion, the real weakness of the U. S. Army in aerial navigation is not in matériel but in personnel. The aeroplane manufacturing plants can now turn out two war flying machines per day, and are capable of rapid expansion.

However, law and regulations in the army limit details on aerial duty to bachelors under 30 years of age. Considering the small percentage thus available and other requirements the available supply is too small.

[Representative People Favor Building Air Fleets for Army, Navy and Militia. *Flying*. Sept '15. 4600 words.]

The editors of *Flying* asked the opinion of a number of representative people regarding the necessity of building air fleets for the Army, Navy and Militia, as a step toward placing Uncle Sam in the position of a porcupine—which spends its days in peaceful pursuits, harms no one, but is ever ready to defend itself. The communications received and published in this article indicate a very general sentiment in favor of adequate preparedness.

[Aerial Activities. *Arms and the Man*, Sept. 23, '15. 150 words.]

The Dutch government has just ordered twenty warplanes of the Glenn L. Martin Company, of Los Angeles. In tests made by Dutch officers, one plane flew 224 miles in 3 hrs. and 25 mins. without a stop. A seaplane climbed 7500 ft. in 1½ hours. Another machine tested carried a useful load of half a ton.

[Navy Aeronautical Notes. *Army & Navy Jour.*, Oct. 30, '15. 500 words.]

The Secretary of the Navy has ordered the construction at the Washington Navy Yard of the first aeroplane to be built at a government establishment. Work will be started at once. The machine will carry a useful load of about 2200 lbs., made up of passengers, fuel or weapons in varying percentages. It will have two 160-h.p. motors, with a speed of 50-80 miles per hour, and a range of seven hours at full speed.

See also

AERONAUTICS — ORGANIZATION — UNITED STATES

—Altitude Records

Capt. A. S. Cowan, U. S. A., commanding the army aero squadron at North Island, Cal., announced on Ja 6 that a new American altitude record for passenger-carrying biplanes was established at the camp by Lieut. J. C. Carberry, carrying Lieut. Arthur C. Christie as passenger to a height of 11,690 feet. The aviators were in the air one hour and ten minutes. Under the rules of the Aero Club of America their record is declared official. The previous greatest height was 9000 feet.

[*Information, July*, '15.]

Flying an eighty-horse-power Sopwith biplane at Hendon on June 6, H. G. Hawker beat the British altitude record of 4,500 feet by rising to a height of over 20,000 feet. The flight occupied an hour and a half, and the descent was made from the highest point in one long glide, which took about twenty minutes. Hawker was out of sight for an hour, during which time he was circling over the Aerodrome and surrounding country. He suffered greatly from cold.

Stevenson Magordon, the Chicago aviator, June 20, established a new American record at Hempstead, L. I., by flying to a height of 6496 feet with two passengers. It was the first time that any altitude flight had been made for record under the auspices of the Aero Club of America with more than two persons in the machine.

[Curtiss War plane mounts 8300 feet with Four. *Aerial Age*, Aug. 16, '15. 500 words.]

[Note in *Army and Navy Jour.*, Aug. 14, '15. 300 words.]

On Aug. 10th Raymond V. Morris established two new American records with passengers. He used the new Curtiss military tractor biplane, designed for the British government. In the first flight, with two passengers, he rose 8200 feet in 27 minutes, and descended in 5½ minutes. In the second flight,

with three passengers, total weight of the four with baggage 800 pounds, he rose to 8300 feet, when the barograph stopped recording. He ascended steadily for five minutes more and then descended in 5½ minutes at the rate of 94 miles an hour. Observers were confident that the machine could have gone up another four thousand feet or more.

The machine is equipped with an eight-cylinder Curtiss motor of 160 horsepower. The observers ride in a cockpit in front of the pilot, who sits back of the planes. It will carry 1500 pounds dead weight at high altitudes, and so perfect is the control that the pilot removed his hands from the wheel while driving at the rate of 94 miles an hour at 8000 ft. elevation.

[Curtiss Warplane Mounts 8,300 Feet with Four. *Aerial Age.* Aug 16, '15. 500 words.]

On August 10th, 1915, at Buffalo, New York, Raymond V. Morris established two new American records for altitude with passengers. He used the new Curtiss military tractor biplane designed for the British Government.

In the first flight Morris with two passengers rose 8,200 feet. The ascent was made in 27 minutes and the descent in 5½ minutes. The previous American altitude record for pilot and two passengers was 5187 ft., made by Stephen T. MacGordon in a Heinrich machine.

In the second flight Morris took three passengers and rose 8,300 feet, when the barograph stopped recording.

The world's record for altitude for pilot and three passengers is 15,650 ft., established in 1914 by von Lossi, an Austrian aviator.

The machine used by Morris in his record flights is known as the Curtiss Model R. It is equipped with a Curtiss 8 cylinder 160 H.P. motor.

[World's Altitude Record. *La Suisse Sportive,* Sept 18, '15. 170 words. Table and illustration.]

A Swiss aviator, Audemars, on Sept 8, '15 broke the world's altitude record by reaching a height of 6600 meters in a Morane monoplane. The flight was made in France at Issy-les-Moulineaux, and the record has been homologated by the Aero Club of France. In seven years the record has gone from 25 meters (Farman and Wright) to 6600 meters (Audemars.)

—Armored Aeroplanes

See

CLEMENT-BAYARD—ARMORED MONOPLANE
NIEUPORT—ARMORED MONOPLANE

—Bombs and Bomb Dropping

See

BOMBS—AERIAL

—Coast Defense, Use of in

See

COAST DEFENCE—USE OF AEROPLANES IN
UNITED STATES — COAST DEFENSE — AEROPLANE SCOUTS

—Combat

[War in the Clouds. *Sphere,* June 12, '15. 200 words. Illus.]

The only effective way to deal with enemy aircraft is to attack them in the air and not by shooting at them with anti-aircraft guns. The fast scouting tractor biplane has proved a successful type for this purpose on account of its speed and climbing powers. The Russians have recently been using the giant Sikorsky biplanes driven by two 200 h.p. Cauton-Unné engines and capable of carrying 16 passengers. With this weight-lifting capacity, a fairly heavy gun or a number of very heavy bombs can be carried.

—Drift and Drift Indicators

See also

SPERRY DRIFT INDICATOR

—Instruction and Training

[Army Aviation Notes. *Army and Navy Jour.,* Sept. 25, '15. 400 words.]

A description of the work at the Signal Corps Aviation School at San Diego shows that the instruction is very thorough. "Each aviation student is required to be under instruction, both theoretical and practical, on the subjects of aeroplanes and motors. For example, the class in motors is under personal and individual instruction at all times. A certain motor is turned over to this class and the aviation students must take it down, overhaul it thoroughly and put it together. It is then put on the block and tested. Finally, the students must pass a theoretical and practical examination on motors. The last portion of the course in motor instruction consists of extensive practical work in trouble shooting. The instructor, when the class is not looking, tampers with the motor. The class then starts the motor and must shoot the trouble. This is carried on until each student has individually had sufficient practice to demonstrate his ability to shoot trouble in the field. The instruction in aeroplanes is under the same system. Certain aeroplanes are turned over for the purpose of instructing the aviation students. The class must take these all to pieces and set them up and properly align them again. New surfaces are made and covered, and in general the class must do everything that is to be done with respect to the building of an aeroplane.

The course for aviation students includes sufficient instruction to insure that each student officer can make fittings and perform any other kind of metal work that is liable to arise at any time in the field. The theoretical course in aeroplanes embraces instruction such as to fit student officers to become inspectors for the construction of aeroplanes. The course in meteorology and navigation of the air is sufficient to insure a working knowledge of both of these subjects. Finally, at the close of the course, which is supposed to extend over a period of five months, there are practical and theoretical examinations of each student officer for the purpose of ascertaining his fitness for the rating of junior military aviator."

—Instruction and Training—Militia

[Aeronautical Notes. Aviation Training for Militia Officers. *Army and Navy Jour.* Oct 16, '15. 500 words.]

The Aero Club of America, bringing to the attention of the Secretary of War certain

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donations for starting aviation work in the National Guard, was informed that Militia officers could be trained in aviation at the Aviation School at San Diego, Calif. Uniformity of training of Militia and Regular officers is very desirable. Sixteen states are ready to take up the work of developing aviation corps as soon as funds can be obtained.

Plans call for the formation of twelve aero squadrons, one for each division of Militia. Due to lack of funds, no progress has been made in this branch of militia instruction. Attendance of Militia officers at the aviation school would be subject to the same conditions as at the army service schools.

—Instrumental Equipment for

[Instruments Used On Aeroplanes. *Scientific American,* July 10, '15. 1500 words.]

These include the engine-speed indicator, the air-speed indicator, the horizontal level indicator, the gasoline gauge, an aneroid graduated in feet height, an oil gauge, and an aeroplane compass. These instruments are explained and discussed.

—Legal Regulation of

[Aviation in Relation to Law, Progress, and National Security. By C. Licomati, Capt. Inf. *Riv. Mil. Italiana,* May, '15. 3600 words.]

Although the principle of aerial navigation dates back at least to Leonardo da Vinci, its practical development has been so recent that there has been little legislation on the subject. The Italian royal decree of Sept 3, 1914, prohibits flying over national territory, seas, and colonies except by military forces or by aviators authorized by the government. Certain branches of the government are charged with the duty of keeping watch over national territory, requiring unauthorized flyers to descend and firing upon them if necessary to enforce obedience. Military and authorized private aircraft are required to carry identifying signals.

The question arises as to whether such severe restrictions will retard the scientific development of air navigation and its commercial use. In time of war there is no doubt of the wisdom of such restrictions, although their enforcement presents many difficulties. The last resort is to fire upon the machines that break the law, and the recent wars show how few hits are made by such fire.

In time of peace, it is best to allow freedom of the air on much the same basis as freedom of the seas. The matter of preventing foreign aircraft from obtaining information as to forts and other military features is one to be met by measures of concealment. With the reduction in the danger of flying and the cost of machines, and the greater ease of control, starting and alighting, it seems possible that this means of transportation will come into widespread use. And like all inventions, this one will doubtless be put to evil uses; hence the necessity of its control by law. Leonardo da Vinci destroyed with his own hands the plans of his submarine boat, because he foresaw its use by pirates.

International law must recognize aviation, and must embody the rules of the air. The limit of height to which a nation shall permit navigation above its territory may reasonably be taken as the effective limit of fire, which is 2000 meters. Another measure of this limit is the height to which captive balloons can ascend. Up to such a limit a nation can maintain effective police of the air. Navigation above the limit should be prohibited, with some exceptions, such as ascents for scientific investigation.

—Manufacture of Aeroplanes

[Spruce Aeroplane Struts Under Compression. By J. C. Hunsaker, U. S. Navy. *Aerial Age.* Aug 16, '15. 1500 words. Illustrated.]

This article will be of interest to officers on aviation duty. Its technical character does not permit of useful condensation. It was found that the effect of tapering struts as usually employed was to decrease the strength unless very carefully done.

Tests indicated that Maine and West Virginia white spruce and Oregon red spruce are approximately of equal strength when used as struts. Three white spruce struts averaged about 10 per cent stronger than three red spruce struts, but no conclusion should be drawn from so few specimens.

[American Woods for the War. *Literary Digest,* Aug. 28, '15. 600 words.]

Europe has exhausted its available supply of walnut for gun stocks, and the markets of the United States are being searched for it. In addition to its use for gun stocks, walnut is pre-eminently the wood for aeroplane propellers. The qualities demanded are strength, elasticity, and freedom from shrinking, swelling, and more particularly from splintering. These qualities walnut combines in greater degree than any other wood.

Hickory, ash, and West Virginia red spruce are also in demand for aeroplane frames.

—Manufacture of Aeroplanes—Dangers in

[Medical Notes. *Parlimentary Intelligence,* p. 773, House of Commons, Sept. 16, '15. 500 words.]

Four fatal and nineteen non-fatal cases of poisoning have occurred from the use of an aeroplane varnish containing tetra-chloride of ethane. Factories are now using greater care.

—Meets and Competitions

[National Aeroplane Competition. *Flying,* May, '15. 5800 words.]

(Present status of the competition being organized by the Aero Club of America, to start July 4 and to end Oct 12.) This competition has for the present been abandoned.

[Note *Army & Navy Jour,* June 26, '15. 150 words.]

The Aero Club of America announces the postponement of the national aeroplane competition and the trans-continental aeroplane race because the attention of both aviators and constructors is occupied by orders for aeroplanes and aeroplane motors aggregating $4,000,000.

[National Aeroplane Competition Promoted to Develop Federal Aerial Reserve Corps. *Popular Mech.*, July '15. 500 words.]

A national aeroplane competition of broad scale is to be held throughout the present summer, to stimulate popular interest and assist in developing an aerial reserve corps. Rules are drawn in the interest of normal flying by regular airmen, the competition being under the auspices of the Aero Club of America. Each State has been requested to enter machines and pilots, and 1200 cities have been asked to assist. Any airmen winning $7500 or more in prizes must volunteer his services to the National Guard or Naval Militia for 15 days during the ensuing year.

Prizes are offered for the best daily cross-country flight, for the best flights across the continent, and for the greatest mileage during the competition. Prizes are also offered for the best machines, low consumption of oil and fuel, and other elements of construction and operation. Certain demonstrations intended to interest the Post Office Department will be attempted.

—Motors

[Aeroplane Motors. *Memorial de Ingenieros* (Madrid), Aug, '15. 11,000 words. Diagrams.]

General Considerations

It is well known that the problems of aeronautics, for both heavier-than-air and lighter-than-air machines, resolve themselves into the one problem of a motor; and this has been the subject of experiment from the earliest days of flying. It is especially important in aeroplanes, since motor trouble invariably entails the landing of the machine.

In 1854, two Italians, Barsanti and Mattencci, obtained patents in England on an interior explosion motor, the principle of which has ever since formed the basis of aeronautic engines. In this the explosion was produced by a mixture of air and illuminating gas; and the successive improvements have been based on a mixture of air and other combustible gases. Complete combustion and maintenance of a minimum temperature have been constant objects of experiment, the mechanical construction of the motor to change the alternating motion of a piston to a circular motion of an exterior wheel not offering great difficulties. Reduction in weight has been of great importance.

The cycle of an explosion motor is composed of a certain number of strokes or "phases," each of a duration corresponding to a single movement of the piston. The majority of aerial navigation motors are "four cycle" [properly called four-stroke cycle.—Ed.], which require for each complete cycle four single movements of the piston, or, in other words, two complete turns of the wheel; and all are, of necessity, polycylindrical.

The problems of reduction in the number of parts of the motor (having in view constantly the work required), the cooling (by water or air), ignition and lubrication are even yet unsatisfactorily solved.

The principal characteristics of a good aeronautic motor are:

1. Maximum power per unit of mass.
2. Uniform power.
3. Strength and simplicity of construction; certainty of operation and elasticity.
4. Maximum ease of manipulation.
5. Facility of installation in aerial vehicles.

Four-cycle (four-stroke cycle) Motors

The "phases" or strokes are those of admission, compression, explosion, and exhaust. During admission, by the action of an initial impulse, the gas mixture is admitted through an open valve from the carburetor, in which the gases have been mixed; during compression the piston head returns and compresses the gas mixture, the valve being closed; the explosion of the compressed gas by ignition causes the next movement of the piston head, the valves still being closed; and during the exhaust the chamber is again emptied through an open valve. [This simple explanation is given by the author to lead up to his mathematical deductions.—Ed.]

During the compression stroke, if V is the volume generated by the movement of the piston head, and v that of the chamber after compression, then $\frac{V+v}{v}$ is the compression ratio, and varies between 2 and 6. The explosion takes place by ignition from an electric spark or otherwise just before the mixture has reached its maximum of compression, and the force generated to return the piston head depends on the proportion of the mixture of gases, on the degree of compression, and on the temperature. The exhaust commences when the cylinder head has moved back about five-sixths of its maximum travel, the piston being again moved forward by the momentum of the flywheel.

The theoretical cycle may be shown by a curve, referred to rectangular axes, in which the abscissas represent volumes of the gas mixture at the several moments and the ordinates corresponding pressures per cubic centimeter of right sections of the gas chamber.

Examining more in detail the several "phases" or "strokes," it is found that, due to variations of temperature and to small, unavoidable differences in the strength of springs for the valves, it is not possible to provide for absolutely perfect functioning of valves equipped with springs and intended to work automatically. As the size and movement of the valves must be in direct relation to the velocity of the piston, it is found necessary to provide for their direct manipulation by an eccentric on the shaft instead of by springs, automatically; and on this account the admission valve is fitted to the shaft with an angle of lag varying from 6° to 19°, with reference to the superior dead point, and the exhaust valve operates at an angle of from 80° to 30°, with respect to the inferior dead point.

Beginning with atmospheric pressure, and the piston starting from a dead point, at the end of admission the interior pressure is below atmospheric. Adiabatic compression

AERONAUTICS—Continued

then causes the pressure to rise regularly—though actually some heat is derived from the cylinder—and explosion raises the pressure suddenly (assuming a constant volume). Theoretically, the expansion which follows should be continued until the pressure drops to atmospheric, but in practice there remains, after completion of expansion, an appreciable excess of pressure over atmospheric, due to absorption of heat by the cylinder. On the completion of the exhaust, the pressure, theoretically, returns to atmospheric.

The value of compression is great in the functioning of a motor, since, with a given volume of gas mixture, the work obtained increases with the compression. As compression increases, the temperature at which the mixture tends to explode spontaneously decreases, the duration of the explosion is briefer, and the pressure at its conclusion is greater. Hence, it is best to increase the initial compression as far as possible without reaching the point of spontaneous combustion.

These conditions require that (a) the valves, piston heads, ignition apparatus, joints, etc., be gas tight; (b) that the dead space of the cylinder be reduced as much as possible, thus increasing the working volume.

In practice, the initial compression does not exceed 5 or 6 kilograms per square centimeter of the surface of the piston head in motors whose usual velocity is not greater than 1000 revolutions per minute.

During the third "phase" (explosion) the initial compression—which terminates the compression stroke—is from 3 to 6 atmospheres, and the final pressure runs from 12 to 30 atmospheres, at a temperature approaching 1500°.

For the most complete utilization of the gas after explosion, it would be better to cause the pressure to fall to atmospheric, a greater change than during compression. In practice, to satisfy this condition, inconveniences are encountered; and, besides, it is best not to lower the explosive pressure of the mixture, as this decreases efficiency.

When the piston has moved some five-sixths of its travel in the third "phase," an eccentric opens the escape valve and allows the exhaust of part of the burned gases before the start of the return of the piston. This prevents a strong counter pressure against the piston when it starts.

Silencers have generally been discarded, as every ounce of weight counts, though military necessity may dictate their use.

Two-cycle (two-stroke-cycle) Motors

[The principles upon which these are based are the same as in the four-stroke-cycle machine.—Ed.]

The work resulting from a cycle

[This is a mathematical deduction from Meyer's general equation.]

$$dQ = \frac{Cv}{R} Vdp + \frac{Cp}{R} pdv$$

in which dQ is the amount of heat required to give an infinitesimal transformation to a unit of weight of gas from an initial state, and Cv and Cp are the specific heats at constant volume and at constant pressure, respectively.

Motor Power

The power of a monocylindric motor is a function of two factors: the mean pressure on the piston head and the rate of travel of the piston; and the calculation can be based on the work performed in one cycle, found as heretofore explained. (Here follows a mathematical discussion and explanation of a power curve, referred to rectangular axes.)

Thermal Efficiency

(Assuming ideal, or adiabatic, conditions, the calculations are made mathematically.)

However, it must be observed:

1st. That the line of compression is never adiabatic.

2d. The temperature and the explosive pressure are sensibly less than those calculated.

3d. The cooling action of the walls of the cylinders is a measurable quantity.

4th. The line of expansion is incomplete, and the pressure on exhaust is always greater than atmospheric.

[Twin-Six Engines for Aeroplanes. By Frederick Eppelsheimer. *Scientific American*, Nov. 13, '15. 1700 words. Illus.]

The need for more powerful and more reliable motors for aeroplanes has resulted in new 12-cylinder engines of stationary type. The "twin-six" has proved a useful type. England and Italy have led in the encouragement of motor builders, both at home and abroad.

The endurance record is a little over 24 hours, held by a German—Reinhold Boehm. Endurance is not the quality desired so much as absolute reliability. Engine failure may mean capture or death. The 100-h.p. engine is no longer sufficient to meet the demands for weight-carrying capacity and speed. The "V" type of engine has been the solution, and balance can be secured in the twin-six with the cylinders set at 60°.

France led the way in the production of 12-cylinder engines for aeroplane work. The Renault engine is well known. It is air-cooled, 96-140 h.p., and weighs 639 lbs.; speed, 1800 r.p.m. Propeller geared to camshaft revolves at half the speed. Since the war began, the Renault company is operating several plants and is now producing ten motors per day for the French government.

Of the 12-cylinder "V" type engine, probably the most notable is the British "Sunbeam," installed in giant fighting biplanes by the Royal Aircraft Factory. This motor is water-cooled, weighs 1085 lbs., and delivers 225 h.p. Two of these motors are used in a 70-foot tractor biplane.

The Rolls-Royce Co. have produced a 250-h.p. twin-six, weighing 800 lbs. Great Britain has also sought motors abroad, and an American-built 12-cylinder "V" engine of 165 h.p. is soon to be tested at the Royal Aircraft Factory at Farnborough.

A 12-cylinder water-cooled "V" type engine

of 150 h.p. and 1200 r.p.m has been brought out during the last year by L. E. Rausenberger. The Ashmusen 105 h.p. engine is a worthy attempt to build a big air-cooled motor. The cylinders will be horizontally opposed. The weight is 345 lbs.

A Johnson two-cycle 12-cylinder engine is announced. It is of the 90° "V" type, like the smaller engines of the same make. The speed is 1150-1400 r.p.m., weight 598 lbs. The engine is rated at 150-180 h.p.

[War Eliminates the Rotary Motor. Note. *Popular Science Monthly*, Dec., '15. 500 words.]

A year of aeronautical experience in war has served to put the rotary motor in disfavor. Under war conditions faults come to light. Motors of aeroplanes must be cared for by men of only average mechanical knowledge. The life of motors is surprisingly short, in some cases as short as four to twelve hours. The rotary motor is very light, but its consumption of fuel, and particularly of oil, is high, so that the advantage in the weight of the motor is lost in the weight of its supplies. Reliability being the prime desideratum, motors with fixed cylinders have come to be preferred.

—Neutrality Aspects of

[Air Navigation as a Violation of Neutrality. Editorial comment. *Case and Comment*, June, '15. 300 words.]

This question has been raised by British aircraft flying over Swiss territory *en route* to Friedrichshafen. Great Britain expressed regret, but did not concede sovereignty of the air. The question is raised—If an aircraft passing through the air violates neutrality, how about wireless messages? British legal opinion seems to recognize air as private or state property only so far as effectively occupied. Effective occupation now means the limit of modern rifle range—say, 7000 feet. One opinion expressed is that an aircraft passing at a height beyond effective control would not violate neutrality. The case suggests analogy to dominion of the sea.

—Organization

[The Allocation of Royal Flying Corps Units to Subordinate Commands. By Major W. S. Brancker, R. A. (now Deputy Director, Military Aeronautics.) *Jour. Royal Artillery*, June, '15. 5000 words.]

(A lecture delivered at the Royal Flying Corps Concentration at Netheravon, June, 1914.)

The distribution of the other arms of the service to armies, divisions, and brigades has been arrived at after generations of experience both in war and peace; but for the allotment of the Flying Corps there is no such experience to guide us. In the assignment of the cavalry, the nearest approach to the Flying Corps, the teachings of history are not uniform. The only course, therefore, is to solve the problem on its own merits, starting from several known and important factors, which are:

(1) The duties to be carried out by the Royal Flying Corps.

(2) The types of aeroplanes suitable and available to carry out these duties.

(3) The supply of spare parts, lubricants, and petrol.

At the present, the first and foremost duty of the Royal Flying Corps is reconnaissance; very soon a second duty will be allotted to us—the prevention of hostile aerial reconnaissance—and ultimately our first duty will become the maintainance of the command of the air.

In the opening phases of a campaign, we may have to send our reconnaissance far afield. To cope with wind and to cover the long distances, the essentials are speed and a good supply of fuel. The hostile troops probably will be well concentrated and easy to see, details will be of small importance, plenty of time to send in the information will be available, therefore a pilot alone in the machine will suffice. It has been expedient to evolve for this work a special type of one-seated scout aeroplane, speedy and of high fuel endurance.

As the hostile forces come nearer, the information desired is more detailed and the troops become more scattered. In this intermediate phase, some of the speed and fuel may be well sacrificed in order to carry an observer and a wireless set.

In the final phase, when the armies come within striking distance, observation of details becomes most important; observation of artillery fire is demanded; and immediate delivery of the information gained is essential. Hence we require a comparatively slow machine, affording a wide field of view, capable of rising quickly and of landing anywhere, and carrying wireless. On account of its low speed, it should carry some type of firearm for defense.

During the first phase, the information will be required by General Headquarters; during the intermediate phase, at first by General Headquarters, but finally by army commanders and the cavalry division commanders; while during the final phase by army, division, and brigade commanders.

From the requirements of the various commanders as to information, we may deduce a logical distribution of the type machines, viz., the single-seater scout to General Headquarters; the fast two-seater to General Headquarters and to subordinate commanders; the slow two-seater to subordinate commanders.

Considering now the prevention of hostile aerial reconnaissance, it is evident that we must attack the enemy's aircraft whether in the air or on the ground, and for this purpose require fighting aeroplanes. These may be used in two ways:

(1) For missions of destruction, such as the attack of particular airships or the destruction of aeroplanes at their landing places.

(2) As "cruisers" with orders to attack and destroy any hostile aircraft they may chance to meet.

Aeroplanes with destructive missions obviously must operate under General Headquarters, since it is to such headquarters that will come the information concerning location of objectives.

AERONAUTICS—Continued

It is out of the question for an aeroplane encumbered with gun and ammunition to rise from the ground, overtake and destroy a fast scout, but it seems probable that the slower types of aeroplane will fall victims. It would seem that the army and division commanders should be responsible for the air over their own heads. Each such commander then requires fighting aeroplanes, and should keep one of his fighters in the air cruising over his area, and others on the ground ready to relieve or go to the assistance of the cruiser if hard pressed. The cruising fighter, furthermore, later may be used for reconnaissance purposes.

The supply of spare parts, lubricants, and fuel is much simplified by having a definite assignment of each squadron of aeroplanes. Roving squadrons always complicate supply, and the complication readily can be imagined if all squadrons are assigned to army Headquarters and by them assigned to subordinate commanders as occasion may require. It will always be necessary to have one or two roving squadrons, but the number of such should be kept as low as possible by making definite assignments to subordinate commanders.

United States

[Army Aviation Organization. *Army and Navy Register,* Oct 2, '15. 500 words.]

Training in aviation is making good progress at the San Diego school; as many aeroplanes will be bought during the fiscal year as the appropriation of $300,000 will permit. The first unit to be turned out by this school was the 1st aero squadron, (2 companies, 8 machines, etc.) sent to Fort Sill to cooperate with the field artillery. One company of the squadron was later despatched to Brownsville, Texas, for scout duty on the border. It is hoped to send out a company to Manila in December; after which another will be organized for the Canal Zone, to be followed in its turn by a third to Hawaii, and a fourth to Manila. Oversea companies will be equipped with hydroaeroplanes. The smallness of the appropriation constitutes the chief handicap on progress. A scout tractor costs $10,000, a hydro $12,000; but the entire cost of maintenance, operation, replacement, etc., is chargeable to the appropriation, leaving but a small amount available for original equipment. An aeroplane company now includes 10 officers, 40 enlisted men, 4 aeroplanes, several reserve machines, spare parts, etc. As soon as funds permit, it is proposed to equip a squadron with 12 machines in activity, 12 replacement machines, and 12 in reserve, with the needed complement of officers, men, and auxiliary equipment.

—Promotion of Peace by

[How Aerial Transportation Will Eliminate Within a Generation Factors that Cause Wars. By Henry Woodhouse. *Flying,* May, '15. 7000 words.]

[In this non-technical article, dealing chiefly with very broad generalities, Mr. Woodhouse sets out his belief that fast transportation and intercommunication, through the air, will prevent future wars.]

—Protection Against Aeronautic Attack

[Air Raids and Asphyxiating Gases. *British Medical Jour.,* June 26, '15.]

The authorities of the City of London have issued the following advice to the public in the event of air raids:

1. The raids will most likely occur at night when the population are in bed.

2. The people should not go into the street, (a) on account of the danger from falling missiles, (b) the streets are reserved for passage of fire engines.

3. Sand and water should be kept on the upper floors to extinguish fire. Everyone should know the position of the fire-alarm nearest his house.

4. Close all doors and windows on lower floors to prevent the admission of noxious gases.

5. A good respirator economically and readily made is a pad of cotton contained in a piece of gauze saturated with a strong solution of washing soda tied over the eyes, nose and mouth.

Washing soda (Sodium carbonate) is an efficient absorbent for most gases of an acidic character such as chlorine, bromine and oxides of nitrogen. Another good mixture to saturate the respirator is the formula recently recommended by the Académie de Médecine, Paris, as follows: Sodium Hyposulphite 1000 grains, Sodium carbonate 200, Glycerine 150, Water 800. Twice the amount of sodium carbonate may be an advantage. Up to date facts show that bombs from air-ships have been incendiary and not asphyxiating.

The general signs of gases irritant to the air passages are present in those who have succumbed to the poisonous influence of the gases. Tissue changes are specially noted in the lungs, spleen, kidneys and blood.

[The Strong Aerial Defenses of Paris. *Sphere,* Oct. 9, '15. 700 words. Illustrated.]

The recent air raids on London and the absence of such raids against Paris have led to inquiries in Parliament. Paris is only fifty to sixty miles from the German lines, yet the city has been free from aerial raids for many months.

There is, however, a difference in the problems of defending London and Paris. London is not a fortified town, and the approach to it is across the water. The approaches to Paris are overland, and Paris, a fortified city, is under a single military government.

In the early stages of the war, Paris was visited day after day by German aeroplanes. The Zeppelin raid on Paris toward the end of March, 1915, the only one ever attempted, drew attention to the defects in the defense against aerial attack. Gen. Hirschauer, former chief of the Aeronautical Department, was recalled to take charge of the defense. Since then many raids have been attempted, but not one has succeeded.

All the way from the German lines to Paris an elaborate system of observation has been established, and every post is connected with Paris by telephone. Immediate warning is thus given of the approach of any hostile air-

craft. The defensive arrangements are ample and consist of many batteries of special anti-aircraft guns, but principally of aeroplane stations at a dozen different points, each ready to send out its squadron of aeroplanes on five minutes' warning. [One of the illustrations shows one of the aeroplane stations forming part of the defenses of Paris. About 20 aeroplanes may be counted.—Ed.]

[The Eyes and Ears of Paris. Photographs. *Independent.* Oct 25, '15.]

[Two illustrations are given, both reproduced from the *Illustrated London News,* and stated to be official photographs from the French War Office. The first picture is that of a large searchlight for use against aircraft, apparently about 36 in., but without special features. The second photograph shows a machine for listening for aircraft. It consists of four reversed megaphones, each apparently 24 in., axes parallel. The small ends are connected by tubes with a microphone, and thence to the listener's ears. The whole machine is apparently pivoted for rotation in azimuth, and on trunnions, thus admitting being pointed in any direction. It is stated that an approaching airship can be heard "for miles."—Ed.]

[Zeppelin Raids: Dangers to Avoid. *Sphere.,* Oct. 30, '15. 200 words. Illustrated.]

Shows by diagrams that it is dangerous to stand near windows by which fragments may enter; that the fragments of a bursting bomb fly laterally and upwards, but that there is a safe area near the ground, so that it is safer to lie down; and that when near the side of the street, there is danger from falling glass broken by the concussion of the exploding bombs.

See also

Dirigibles—Dirigible Destroyers

—Rail Transportation

[Aviation Notes. *Army and Navy Jour.,* Aug. 7, '15. 100 words.]

For transporting the matériel of the 1st Aero Squadron, ten cars were required as follows: One car for mounts, one automobile car for automobiles, four automobile cars for eight motor trucks, and four automobile cars for eight aeroplanes and for motors, spare parts, etc. The squadron has not yet the full authorized equipment.

—Reconnaissance by

[Military Aviation in France. By A. S. Barrow. *Sphere,* June 19, '15. 1000 words.]

New points brought out in this article are that by screening the positions of the pilot and observer, it is now possible to fly in the rain, something impossible in open seats. Wind is no longer dreaded, and a 50-mile steady wind is less unpleasant than the conditions of a hot, still, thundery day in summer.

The advantage of aeroplanes over dirigibles for reconnaissance in misty weather is noted. The aeroplane can descend to the low altitude required for observation under such conditions, depending upon speed and small target for protection, while the bulk of the dirigible makes this impossible.

The advantage of speed for work in wind is also pointed out. Assuming a flight to a point 90 miles distant and return in a 60-mile wind, a 100-mile aeroplane can make the trip on a 3-hours' supply of fuel, while a 70-mile aeroplane with 8 hours' fuel would run out of fuel before getting to the distant point.

—Records

[Army Aviation Notes. *Army and Navy Jour.* Oct 2, '15.]

Lieut. W. R. Taliaferro, U. S. Signal Corps established on Sept. 17 at San Diego a new American endurance record of nine hours and forty eight minutes. He used Signal Corps Aeroplane *No. 31,* with Curtiss-Ox motor.

See also

Aeronautics—Altitude records

—Tactics—Squadron Formation

[Notes on the War. *Army and Navy Jour.,* Aug. 28, '15. 150 words.]

The French have formed aeroplane squadrons for the purpose of operating against the enemy's communications just prior to or during battle. The squadrons comprise three different types of machine, the bombplane, the gunplane, and the chaser,—the name indicating the use. These squadrons are reported to have raided numerous railway centers in the area of operations, the chasers engaging any protecting enemy aircraft.

—Use of Wireless in

[Wireless Telegraph in Air Ships. Some General Ideas. By 1st Lieut. B. Arriagada, Chilean Army. *Memorial del Estado Mayor de Chile,* May 1, '15. 2000 words. Diags.]

(A partly technical discussion of the use of wireless in aeroplanes and dirigibles.)

—Use of in European War

[The War in the Air. *Flying,* Jan 15. 7800 words; illustrations, sketches of Friedrichshafen raid.]

(Most of the article is devoted to the chronology of aerial war events from Nov 1914 to Dec 1914. This chronology is continued through the April number—8600 additional words.)

The employment of aeroplanes in scouting and range finding has become so common that the matter no longer warrants reporting. Only a few of the long raids are reported in sufficient detail: of these the attack on the Zeppelin factories at Friedrichshafen is the most impressive. F. M. Sir John French is quoted as saying that "The work performed by the Royal Flying Corps has continued to prove of the utmost value to the success of the operations . . ." "Almost every day new methods for employing them [the Royal Flying Corps] both strategically and tactically are discovered and put into practice." In the Feb number a sketch is given of the Cuxhaven raid.

[Germany's Wrecked Airships. *Flight.* Feb. 26, 1915. 1000 words.]

Extracts from newspapers, with comments on the loss of the L3 and L4. In each case the motors failed.

AERONAUTICS—Continued

[Air Craft Work at the Front. Official Information. *Flight*. Feb. 26, '15. 1000 words.]

An official French *communiqué* gives an account of a night flight, during the course of which the French aviator from heights of 120-250 meters succeeded in dropping bombs on an ammunition section, and in Ostend on the spot apparently occupied by the Headquarters Staff. Two planes frequently hit nevertheless returned safely to their own lines after accomplishing the purpose of their journey. "The French aviators have acquired an incontestable mastery and superiority. In the subsequent development of operations the fifth arm will certainly be called upon to play an important part."

[Aircraft and the War. *Flight*. Feb. 26, 1915. 3000 words.]

Extracts from newspapers, describing various aerial raids and air combats. Zeppelin L5 is announced to have overhauled the Dutch ship *Helena* at sea on Feb. 16. The bombs dropped on Calais, Feb 15, suggest a powerful explosive, one of the craters made being 18 feet in diameter. The cardinal weakness of the Zeppelin lies in its inability to operate in daylight through fear of hostile aeroplanes; by night, seeing is difficult.

[Air Craft Work at the Front. *Flight*. March 5. 1915. 300 words.]

A single aviator on Feb. 27 discovered 21 enemy (German) batteries. On Feb. 18 a heavy battery was discovered; fire on it proved effective, exploding ammunition wagons.

[Aircraft and the War. *Flight*. March 5, 1915. 1200 words.]

Aeroplanes flying over the German lines in the La Bassée district succeeded in locating six batteries, which in a few minutes were shelled by the French artillery.

Russian aviators assisted the retreat of a division by continued dropping of letters containing valuable information; and when ammunition began to fail, brought up considerable quantities from the distant rear. The boxes were wrapped in rags and dropped within reach of the troops. A Zeppelin on patrol duty over Cologne, protecting the military bridges of the Rhine, is reported as blown down by a storm and damaged beyond repair.

[Aircraft and the War. *Flight*. March 12, 1915. 200 words.]

Zeppelin L-8, on account of engine trouble, descended rapidly in a field near Tirlemont, March 4, and became a total wreck. Another Zeppelin is reported as having been captured near Bethune. Thanks to the use of wireless, it has been found possible for the artillery (British) to locate and hit a moving target before it could reach shelter.

[Air Craft Work at the Front. *Flight*. March 12, 1915. 1000 words.]

Air reconnaissances by seaplanes have succeeded in locating new gun positions in the Dardanelles forts, a line of surface mines, encampments and permanent batteries.

The French report officially, March 4, that Captain Happe bombarded the German powder magazine at Rottweil and that his success was complete. Ten minutes after launching his bombs, the powder magazine was on fire. Official statistics regarding aerial services carried on by the French aviators show that in eight months 10,000 reconnaissances were made, corresponding to over 18,000 hours of flight. The distances traveled sum up 1,800,000 kilometers.

[Air Craft Work at the Front. *Flight*. March 19, 1915. 200 words.]

British aviators destroyed the railway junctions at Don Douai and Courtrai.

[Aircraft and the War. *Flight*. March 19, 1915. 1500 words.]

The Germans are reported as throwing asphyxiating shells from aeroplanes into the Russian lines. The airship destroyed near Tirlemont, as reported above, was, according to later reports, not wrecked by engine trouble, but brought down by two French and two English aeroplanes. The value of the air service in the Neuve Chapelle fight is confirmed—"not a gun was laid, not a body of troops moved without being detected" by airmen.

[Air Craft Work at the Front. *Flight*. March 26, 1915. 1400 words,]

German aeroplanes dropped bombs from a great height, in one case of 9000 feet, on Lillers, St. Omar and Estaires. No military damage was done. A Zeppelin raid on Paris (four airships) came to naught. Two ships were driven off before reaching Paris, the other two attacked by aircraft guns, did no more than pass over the outlying districts of the northwest of the city. Forty bombs were dropped on the station, Conflans-Jarny and the adjoining railway lines.

[Aircraft and the War. *Flight*. March 26, 1915. 1200 words.]

Communication between Przemysl and the Austrian lines seems to have been maintained almost daily by means of aviators, who would take out letters and bring back stores. One of them was able to carry as much as 4 cwt. in his machine.

[Air Craft Work at the Front. *Flight*. April 2, 1915. 400 words.]

The effect of the British artillery at Neuve Chapelle was due in no small measure to the air service. Owing to the misty weather prevailing, aviators were compelled to descend as low as 800 feet above the hostile batteries.

[Aircraft and the War. *Flight*. April 2, 1915. 1600 words.]

An aerial battle in which twenty aeroplanes were engaged on both sides took place March 21 between Lörrach and Mülhausen. The French came from the Vosges and the Germans from the Black Forest. German forts and batteries opened on the advancing French

squadron. This is considered to be the greatest aerial battle since the beginning of the war.

[Aeronautics; Lessons of the War. *Scien. Amer.*, Apr. 10, 1915. 200 words.]

From a statement, by Baron D'Arcy, the French use three classes of aeroplanes: destroyers, artillery spotter, and scout. The destroyers are pushers, have a gun in front, carry bombs and wireless apparatus, fly at 2000 meters, and need no armor. The artillery spotters fly at 1000 meters in observation, and are armored against rifle bullets. They also carry wireless. To enable them to fly slowly and climb quickly, variable speed is being developed. The scouts used on reconnaissance and as messengers, are about 80 mile machines, operated by one man armed with rifle or revolver. Higher speed offers difficulty in landing. A few higher speed machines are in use, principally near Paris.

Aircraft have little to fear from anti-air craft guns, which are very inaccurate in aim.

[Progress in Aeronautics. Major H. Bannerman-Phillips. *United Service Magagine.* April, '15. 4000 words.]

The great value of aerial reconnaissance of the present war has been amply verified. But the destructive raids of as many as forty aeroplanes and seaplanes at one time show that this is not the only class of service to be expected from the flying branch in the future. In the raid across the North Sea, the difficulties of high wind, much snow, and even the fire of the enemy were surmounted, while at the same time ammunition was carried for their destructive work. The summer may see raids of fleets of one hundred aeroplanes. The part played by this branch will become more and more important as the war progresses, and "surprise concentration by the most perfect railway system will become almost impossible."

The armoring of aeroplanes is an experimental question of great moment. The French have gone in for it, while the English have not. One British explanation is that their aviators depend upon speed and quick climbing. This can only be true for their fastest machines, as they have a great many that are slow. The great object of armoring is to enable a pilot to fly low enough to observe in detail the disposition of the enemy and escape without serious damage. The well-armored French machine has the pilot, observer, and the engine protected from below and partly from the sides. Armoring necessarily cuts down speed and carrying ability; but, on the other hand, high flying makes reconnaissance difficult, in view of the use of all kinds of devices for concealment.

There are several ways of maneuvering out of danger of the projectiles of anti-aircraft guns. One is to fly directly overhead, as no such gun is mounted to give vertical fire. To steer a course so that the enemy's projectiles in falling to earth will damage his own people or property is another way. Flying very low and close to the enemy's works or by taking cover behind objects like hills, buildings, etc., will sometime frustrate his fire. With the enemy's aircraft in the air, it is best to maneuver so as to place these in the danger zone also. This will stop hostile fire from below. The greater the number of machines in a raid the more divided must the enemy's fire be.

The ascendency claimed by the English over their enemy in the air is important, since artillery range is a factor of atmospheric condition and wind and needs direct observation of its effect by aircraft. "The German military aeroplanes are far more numerous than our own, they have more powerful and more reliable engines, and the modern ones climb faster and fly faster than the majority of ours." However, there is an English single-seater biplane scout type, called "tabloids," that is faster than the best German machines. The Vickers biplane is speedy and carries a machine gun. From these the English can choose a mount satisfactory for any work.

Germany's strong aerial position is due not only to her training a large number of aviators and securing so many of the latest aeroplanes before the war broke out, but also to "her policy of encouraging native manufacture and of refusing to subsidize government departments to compete against this industry," with the result that "the collective output was known and admitted to be greater than that of all aircraft works possessed at that period by the Allies." Now this is no longer true, for the Allies can build machines and train pilots at a quicker rate than their enemy. However, even at the outset of the war the Germans did not take the offensive in the air, according to their pet theory of war, and the Allies claim a decided superiority in the aerial operations to date.

[The Importance of Aerial Supremacy. Note *Sphere*, May 1, '15. 250 words.]

In no engagement in the war have the aviators rendered such valuable assistance as did the English and French aviators in the fighting around Hill 60 and Ypres. Under cover of their activity, the troops and artillery were concentrated for the attack without the knowledge of the Germans.

Every German aeroplane appearing over the British lines was immediately chased and driven away or brought down. Five German aeroplanes were brought down in the area around Ypres alone in five days,—Apr 15-20.

[The War in the Air. *Flying*, May, '15. 5000 words. June, '15. 2600 words.]

[A chronological record of aerial events from Mar 21, '15, to May 16, '15.]

[The Aeronautic Lessons of the European War. By C. Dienstbach, *Scientific American*, June 26, '15. 5000 words. One illus.]

The war has served to advance greatly the science of flight, and aerial navigation is now carried on under almost all conditions of weather. Aerial combats are decided by firearms, and the swift, quick climbing aeroplane has a great advantage in maneuvering. The Germans had been producing stable ma-

AERONAUTICS—Continued

chines with reliable engines, neglecting speed and climbing power. The British and French had more varied types and have consequently had the advantage in aerial combats. Much has been learned about bomb-dropping, the most successful method being to dive near to the target and let go all bombs at short range and then climb quickly out of danger.

Markmanship is a deciding factor in aerial combat. Hence it is possible that one development may be that of carrying an expert rifleman as a means of offense and defense in the air. Bullets do little structural harm to aeroplanes. The destruction of the machine requires explosive shell.

Apparently aeroplanes have been set on fire by bullets striking petrol tanks. Fiber tanks are suggested as a means of avoiding this danger.

[Aeroplanes and Artillery, England. *Revista de Artilharia,* July, '15. 135 words.]

Mr. Asquith, in a recent speech in the House of Commons, said, with reference to the assistance given artillery by aeroplanes:

"It is needless to say that, since the principle of war is recognized with reference to the employment of artillery on all kinds of reconnaissance, the scientific use of aeroplanes is one of the rudimentary necessities of all the armies and navies of the world.

"Any government, and especially this one, will be gravely at fault if it does not equip all its forces with the mechanical necessities for an Aerial Fleet, and also guarantee an adequate reserve of pilots and trained observers.

"No part of our military and naval problems merits more constant attention than this."

[The War in Europe Note. *Army & Navy Jour.,* July 17, '15. 100 words.]

According to German official figures, the Teutonic allies have up to June 22, brought down 57 French, 47 English, and 26 Russian aircraft,—a total of 130. Most of the aeroplanes were brought down by gun and rifle fire, but about 1-5 of the French aeroplane loss resulted from battles in the air.

[How the War in the Air Developed. By N. W. Wilson. *Flying,* July, '15. 2500 words. Illus. *See* continuation under ANTI-AIRCRAFT ARTILLERY.]

Aviation service at the outbreak of the war was largely in the experimental stage, with the Germans having rather the better of it. The French caught up when the trained civilian air pilots came in, and General Hirschauer, a strong reformer, soon raised the general standard of military aviation. The British Flying Corps had no defects of personnel to be remedied. It was the British men who detected Von Kluck's swerve to the southeast, and followed the German retreat to the Aisne. The Germans may now be said to have lost the "Command of the Sky" on the western front. The results of allied supremacy were however not at first apparent, for the simple reason that the Allies had nothing to oppose to the German heavy artillery. The discovery of enemy artillery was often useless, because no weapons were available to smash the positions. In the meantime, the airmen of the Allies by combat superiority robbed the Germans of the advantage they had in their guns. One of the elements of British air supremacy was the small high speed scouting Sopwith and Bristol aeroplane. These were faster than the German, who in their turn were faster than the French. But the Voisin biplane and the Caudron machine, soon brought the French up to the level of the enemy. The improvement in allied air craft was accompanied by an increasing power in artillery, and thus enabled the allied airmen to operate to greater advantage. Observation was spread over a wider area, took in more objects; strategical was accompanied by tactical reconnaissance. The direction of artillery fire was unceasingly kept up, and material damage done wherever possible. The aerial arrow used by the French proved to be a terrible weapon.

Air scouting was however not always successful. An entire German corps was lost by the airmen in the movement toward Arras. It is supposed that it concealed itself in the forest. But even so, the tedious operation of marching an army corps to a forest, there to scatter it for subsequent reassembling is a testimonial as to the value of air observation. On the other hand, a German cavalry division was defeated by a few airmen on October 15.

As the campaign continued, an improvement was noted in the German air material. But fortunately, various new makes of aeroplane were available, capable of overtaking the best of the newest German types.

[The War in the Air. *Flying,* July '15. 8000 words.]

Chronology from May 17 to June 16: The features are the Zeppelin-London raid June 1, a total failure, and the activity of the French bombardier aeroplane squadron. Three of these raids are important, on account of the scale on which carried out. The first, of 18 units, appeared over Ludwigshafen and shelled a munition factory, sending down 85 bombs.

The second, 29 units, attacked the headquarters of the Crown Prince, 178 bombs. The third, 23 units, raided Karlsruhe; 120 bombs wrecked the ducal palace, and severely damaged the railway station and an arms factory. We must notice here the development of the fighting aeroplane of long cruising radius, and great lifting capacity. Some of the French bombs thrown in the raids mentioned weighed 220 pounds each.

[The Fighting Fliers. By C. G. Grey (Ed. London *Aeroplane*). *Popular Mech.,* July, '15. 3300 words.]

Eight months of war enable an estimate to be made of the value of aeroplanes in military and naval operations, and of the relative value of various types of aeroplanes. British army and navy officers foresaw accurately the requirements, but as in the United

States, their recommendations had not been heeded.

The first task of Great Britain was the manufacture of aeroplanes, and in France and Germany as well, experimental work gave way to the work of production. Defective types were discarded and effort concentrated on the production in types of proved value. The monoplane has been practically abandoned. With greater surface, the biplane can land at slower speed and rise more quickly, immense advantages in military machines. The lifting power of the biplane is also greater.

The French "parasol" type of monoplane has been retained for observing artillery fire because it gives the pilot and passenger a clear view below, and for such observation need not carry a load. The German "Taube" (=dove) monoplanes are rarely seen, having been discarded because of slow flight and lack of climbing power.

At the beginning of the war, the British airmen did the bulk of the work on the western front, the French flying service having been concentrated in eastern France. The British airmen were well equipped, their Avro two-seated tractor 80 h. p. Gnome engine, the "B. E." tractor biplane, 70 h. p. Renault engine, the Sopwith "tabloids" and the Bristol scouts of similar type all being faster and better climbers than the German aeroplanes. British officers are well adapted temperamentally for aerial service.

Preconceived notions in regard to bomb dropping have been changed. Considerable material damage has been caused by this phase of aerial work. (Several instances are here cited.) In one raid in which a Zeppelin shed was blown up, the method used was to reach Düsseldorf at a height of over 5000 feet, when the anti-aircraft guns opened fire. Diving vertically to about 500 feet from the ground, the dive was discontinued, all bombs dropped from this low altitude where hits were practically certain, and the machine quickly climbed to safety. The rapid alteration of range rendered fire ineffective. An effective raid was made on the Zeppelin works at Friedrichshafen. Recently raids participated in by as many as 40 aeroplanes have been made on the Belgian coast towns to interfere with German submarine activities.

On the sea, the sea planes are carried usually by fast unarmored ships. The planes used are of a type produced by the Short Brothers with folding wings. Seaplanes are much used in hunting for submarines and mines.

In the fighting around the Dardanelles, the seaplanes have been very useful. They gave accurate information of the advance of the Turkish column in the attempt against the Suez Canal, and have been used in watching the movements of Turkish troops, observing fire on the forts, and in bomb dropping. The Turkish aerial service was inefficient.

In fighting between aircraft, the most effective weapon is the machine gun. There is difficulty in its use on a tractor, and the best equipped machine for aerial fighting is a pusher biplane armed with a machine gun. One of the most successful of this type is the Vickers gun carrier, of which quite a large number are in use. The Short Brothers had produced just before the war a big 160 h. p. seaplane carrying a 1½-pounder quick-firer.

Experiments are being made with "inherently stable" machines, so that they will not fall immediately if the pilot is hit. Some sacrifices of efficiency are involved in this type.

Not much has been done in the way of armoring aeroplanes on account of the weight. Practically all the British and most of the French aeroplanes have bullet proof seats for the pilot and passenger, affording some protection. Some machines also have the tanks protected by bullet proof plates.

The aeroplane can stand more damage than was thought. One machine came down safely with between 100 and 200 bullet holes in it. Few defects in design have been discovered.

The aeroplane has not operated to shorten the war. They have served to warn both sides of movements of troops and thus enabled the necessary counter measures to be taken. The two armies are now facing each other in parallel trenches, and neither side can attack in force without the pre-knowledge of the other.

[How the War in the Air Developed. By N. W. Wilson. *Flying*, Aug. '15. 2000 words. Diags. and illus.]

With many fewer than one hundred pilots in the British Army, during the first month of the war, the total mileage of the flyers was 87,000. In order to accomplish this enormous amount of work the personnel of the flying corps was very much overworked, and even at that there were not enough machines with the Expeditionary Force. The Germans, on the other hand, were excellently equipped in the Aisne campaign and in the subsequent trench campaign. In addition to their aeroplanes they had sausage shaped balloons, ridiculous in appearance, which did most excellent service, and which they protected from aeroplane attacks by posting near a battery of anti-aircraft guns. Although the British flyers were able to escape destruction by these guns, they could not accomplish any results in reconnaissance under their fire. Some of the shells burst at a height of 22,000 feet. Some of the guns were semi-automatic; the first shell opened out a parachute, which afforded a conspicuous mark for the correction of the succeeding shots, six of which followed in rapid succession. Often the guns were placed in a triangle. On the appearance of an aeroplane, the nearest gun would fire a shell which burst with red smoke; the second gunner took the range with correction and fired a shell that gave black smoke; the third gunner then had three marks, the two smoke clouds and the machine, from which to get his data; then the whole triangle of guns would let forth a stream of shells by a semi-automatic device.

At first the German gunners did not seem to understand bird shooting and as a consequence they invariably missed. They aimed directly at the target. Later they learned the

AERONAUTICS—Continued

art, but the British aviator also learned that he had time to dodge, and on observing a gun fire would swerve, dive, or soar, or even alter the speed of the machine. The pilot and the observer were protected by bullet proof shields, and though many of the machines were hit, few of them were brought down. Sometimes a petrol tank was punctured or a vital part injured, and the pilot was able to volplane to safety.

Shortly after the lines began to hold firmly from Ypres to La Bassée a complete co-operation was perfected between the artillery and the airmen, and to each artillery brigade were assigned its own aviators, the pilots being skilled artillery officers. One heavy piece, named by the soldiers "Mother," was able, by aeroplane direction, to secure some splendid results, on one occasion getting hits on a moving train eight miles away, by means of wireless direction from the aeroplane.

In November the fogs and mist of the low plains made observation difficult from the aeroplanes, and doubly difficult from the guns in following the machines and securing firing data. Wireless then came into play with good results.

The prevailing autumn winds in the west were from the ocean, and this gave the allied machines the advantage, since they could go out at high speed and then choose their route returning, while the German machines had to make their way against the wind, with a decreasing speed, resulting in more loss to them than to the Allies in making the reconnaissances.

The Germans were more cautious than the British and French, and avoided, as far as possible, all encounters in the air. To the Allies it appeared that the German fliers had general orders to avoid combat.

[Russian and German Aviation Services. *Army and Navy Jour.*, Aug. 7, '15. 400 words.]

The following is taken from a bulletin of the Aero Club of America. Reliable reports state that the Russian failure in operations against the Germans has been attributed to the disparity of the aviation services of the two belligerents. Germany had 1000 aeroplanes and an equal number of trained pilots at the beginning of the war. Russia had 800 aeroplanes, but only 400 pilots, most of the latter without experience in military work. Russian aeroplanes were of many types, so that pilots could operate only those machines with which they were familiar. The German pilots and the German artillery had had experience in aeroplane control of fire, while the Russians had had none. As a result the Russian aerial service was almost completely dominated by the German.

Russia is now building large, armored pusher biplanes intended to carry pilot, gunner, machine gun, and bombs at 80 miles per hour; flying boats of the "America" type are being ordered in the United States.

[Foreign News. Edited by L. D'Orcy. *Aerial Age*, Aug. 16, '15. 1200 words.]

On July 30, an air raid was made by 45 French aeroplanes on the petrol works at Pechelbronn. 103 bombs were dropped, and all machines returned safely. This was the greatest number of aeroplanes which had till then participated in a raid. Seven other raids are mentioned in which 18 to 40 aeroplanes participated.

A later copy of *L'Illustration* reveals the fact that French airmen are operating in conjunction with the Serbians.

See also
EUROPEAN WAR—AIR OPERATIONS

AEROPLANES

See
AERONAUTICS

AIRCRAFT

See
AERONAUTICS

AMBULANCE COMPANIES

[An Ambulance Company in Garrison, on the March, in Camp, in the Field; with an Analysis of its Equipment. By Capt. L. L. Hopwood, Medical Corps, U. S. Army. *Military Surgeon.* Feb., 1915. 14,000 words, tables, one sketch.]

(This article gives in detail the routine duties of an Ambulance Company under the conditions stated, and is valuable to a Medical Officer without experience in command of such an organization. It sums up three years' experience.)

See also DOGS—SANITARY SERVICE.

AMERICAN LEAGUE TO LIMIT ARMAMENTS

A branch of the American League to Limit Armaments was formed at Boston Apr 24. Oscar G. Villard urged the creation of a new cabinet officer, to be known as secretary of peace, and the submission of war issues to the people, instead of to a lobby of army and navy officers.

AMERICAN LEGION

Justice Gavegan approved the incorporation of the American Legion, which came into existence Feb 26, in the Supreme Court in New York City, Mar 4. The application reads:

"It is formed to promote patriotism and to organize American citizens not in the military or naval service of the United States or any of the several States who are especially qualified to serve the United States in the event or imminence of war."

AMMUNITION

See also
BULLETS
DUM-DUM BULLETS
EUROPEAN WAR—AMMUNITION
EXPLOSIVES
MACHINE GUNS—AMMUNITION
MUNITIONS
SHRAPNEL

—Cost

[Current Notes on the War. Editorial. *Artill. Monatshefte*, June, '15. 4500 words (total).]

The Ordnance Department U. S. reports the cost of manufacturing the following projectiles:

3 -in. light field gun..........	$10.50
4.7-in. heavy field gun........	30.00
6 -in. heavy field howitzer....	46.50
6 -in. gun	65.00
12 -in. howitzer	324.00
12 -in. gun	540.00
14 -in. gun	867.00
16 -in. gun	1300.00

Torpedoes cost $9250.00, $1345.00 of which is for the high explosive charge.

—Manufacture of

[The Famine in Shells. *Arms & Explosives,* May 1, '15. 1300 words.]

The difficulty of securing supplies of large shell commensurate with the demand causes comment. Shell-making is mostly a lathe opation, and the problem involved is to reduce the rough forging or casting to final dimensions within the smallest possible space of time. Obviously this calls for special skill due to long training, the lack of which is evident when war supersedes peace conditions. Should repeat manufacture not be reduced to a science by competent overseers, the true capacity of the shop is not reached. The principle obstacle to reform is the belief of shop managers that diminishing the wages' cost is all that is reasonably possible. When war comes, output has to be increased; but normal working hours cannot be profitably prolonged. To high pressure most men will conform, but high pressure *plus* long hours spells failure. Machinery can be pushed to extremes, but only under competent knowledge.

See also

INFANTRY—ARMS—AMMUNITION—MANUFACTURE OF

—Materials for

See also

COTTON

TRINITROTOLUENE

—Use of in European War

See

EUROPEAN WAR—AMMUNITION

ANGULAR TRAVEL RULE

See

COAST ARTILLERY—RANGE FINDING—ANGULAR TRAVEL RULE

ANTI-AIRCRAFT ARTILLERY

[Anti-Aeroplane Guns in the Field. By "Anti-Aircraft." *Journal of the Royal Artillery.* Mar, '15. 1300 words.]

Aeroplane messengers can fly beyond the reach of projectiles, but bomb dropping and observation can be done effectively only from moderate altitudes. The great rôle of aircraft is the discovery of targets for artillery, and as observing stations for fire against these targets. The airman will see many suspicious places where targets may be. His principal clues will be the flash of guns, movement about a position, and the tell-tale wheel tracks leading to artillery emplacements. Every effort should be made to conceal the latter, and if this is impossible, additional tracks should be made to confuse the observer. When aeroplanes are about, all movement and casual gunfire should cease.

The anti-aircraft gun must be a high velocity quick firer, adapted for rapid loading at high elevations, easy to sight and fire. Tracers are useful for observation of fire.

The gunnery problems are intricate, but a system has been worked out. There is no time to wrestle with theory when the aeroplanes come in sight. Instant action is required, and volume of fire must be used to compensate for lack of accuracy.

The speed and maneuvering power of aeroplanes coupled with the difficulty of observing fire directed against them, make them difficult targets to hit. But height adds to the security from fire, and the human airman will fly high to keep out of this fire. But altitude seriously diminishes the effectiveness of observation. The anti-aircraft gun need not hit the aeroplane to fulfill its true function. If it can keep the aeroplane from flying low, it is worth more than it costs.

[Aircraft in War, and Their Counter Measures. By Captain O. F. G. Hogg, R. G. A. *Jour. Royal Artillery,* May, '15. 3800 words.]

The present European War has placed aircraft for military purposes on a firm footing. Therefore it behooves the army, in this department to gain superiority over the enemy, by having a more effective flying corps and by having a good service of anti-aircraft guns. Which of these two features predominates in the combination depends upon national policy. Much has been written of the aircraft services but very little as to the gun defense against aircraft.

The type of work performed by the airmen may be classified under three heads:

(a) Tactical reconnaissance.
(b) Strategical reconnaissance.
(c) Air-raids by means of bombs.

In the tactical reconnaissance, the aviator is encountered within the fighting area. He does not go far from the fighting lines, hence time is important to prevent his accomplishing his object. Therefore mobility of the gun is of great importance so that it can be brought quickly to the required spot if necessary. The gun must go into action at once and time for a deliberate precalculated high angle fire will not be available before the hostile aviator gets beyond range. Experience has shown that, for defense against this class of reconnaissance, the gun must be quick firing, of high velocity, firing a 1½ lb. to 2 lb. percussion shell, each containing a day tracer if practicable. The method of fire must be "trial and error." The gun must be mounted on a motor, the mounting being of the pedestal type admitting of instant all-around traverse with the shoulder. These guns should form part of the division.

Aeroplanes in strategical reconnaissance will operate at from five to thirty miles in rear of the fighting lines. The guns for defense against this class of reconnaissance should be attached to corps and army headquarters and should be located at convenient points be-

ANTI-AIRCRAFT ARTILLERY—Continued

tween them. The same mobility is not required as for defense against tactical reconnaissance, but the gun must be able to move when headquarters moves. Preparations may be made for careful and more accurate firing, and facilities for the observation of fire may be devised. Therefore a heavier gun firing shrapnel may be used, although the lighter gun designed for defense against tactical reconnaissance is entirely suitable. In any case the methods of fire must be more precise.

The objectives of bombdropping raids are material objects: capitals, docks, bases, and lines of communication. The objectives being stationary, the guns for their defense will be on fixed mountings. Plenty of time is at hand to perfect all arrangements for conducting an accurate observed fire. Separate guns for dirigibles and aeroplanes should be provided. For aeroplanes a gun is required similar in type to that provided for defense against reconnaissance, except that it should be on a fixed mount. For dirigibles, a larger gun is required, the 3-inch anti-airship gun being the best thus far. High explosive shell should be fired until friendly objects are endangered by the fall of unburst shell, when a change should be made to shrapnel. It is believed that to date the ineffectiveness of anti-aircraft guns has been due to the use of too many converted guns. We should have guns specially designed, having the required properties in ballistics and ammunition.

See also
MACHINE GUNS—ANTI-AIRCRAFT FIRING
FIELD ARTILLERY—DEFENSE AGAINST AIRCRAFT

France

[France's New Gun for Attacking Aircraft. Editorial, *Heiji Zasshi*, June 1, '15. 200 words.]

This is a very powerful gun, firing a shell of about 36 pounds with a muzzle velocity of about 1870 feet and may be operated in any direction. Its recoil of one meter is overcome by air pressure. Its calibre is 4 inches and weight including armor and shields is about 2 1-3 tons.

—Range Finding

[Aeroplanes as Targets. *Arms and Explosives*, May 1, '15. 2700 words. Diag., 6 tables.]

Assuming 55 m. p. h. as standard speed of an aeroplane, altitudes of 1000, 2000, and 3000 ft, and angles of fire of 30°, 45°, and 60°, the problem is to decide the ranges as measured along the line of sight for these nine combinations, the time of flight, and the displacement of the air craft during time of flight. The diagram of altitudes, horizontal distances, and angles of aim, furnishes the absolute ranges of aircraft under the conditions assumed.

The next step is to correct these absolute ranges for the displacement of the target during the time of flight of the bullet. These "allowances" are set out in a table, and when transferred to the diagram reveal the fact that the points to be aimed at lie substantially in a straight line from the firing point, for each elevation assumed. Hence the automatic forward allowance correction is practically constant over a considerable section of the flight of the target. A table gives the allowances in question converted into "skyspace," and later another table sets out this "skyspace" under the form of additions to sight elevations.

The (probable) conclusion is drawn "that an aeroplane at any altitude between 2000 feet and 3000 feet and probably up to at least 4000 feet, can be reduced to the equivalent of a stationary target by a fixed angular correction on the sights in the neighborhood of 160 minutes. This correction holds good during the passage of the target from a distance of 1000 yards measured horizontally till it is practically overhead."

[Ranging a Gun, or Howitzer, on a Balloon or Kite, using Time Shrapnel and Instrumental Observation. By 2nd Lieut. H. Gillman, R. G. A. *Jour. Royal Artillery*. July, '15. 750 words. 1 diagram and 1 table.]

The system of ranging with time shrapnel on a balloon or kite using instrumental observation is explained very clearly in the Amendments to "Garrison Artillery Training," Volume II, 1911, issued with Army Orders dated 1-11-1914.

When ranging, the elevation and fuse must be corrected for at the same time. This article gives a method and a table for reducing the amount of calculation required of the battery commander in correcting his fuse.

For the method used and the table, reference should be had to the complete article which must be read in conjunction with Garrison Artillery Training.

[Airship Range Finding. By Captain H. M. A. Ward, R. G. A. (T. F.) *Jour. Royal Artillery*. Aug, '15. 400 words. 1 sketch.]

A sketch and description are given of an instrument for finding the range to an airship. It depends for its results on measuring the angle subtended by an airship of known length and recording the results in range. Means are provided for correcting when the airship is approaching at an angle or bow on, and also for illuminating the range drum for night work.

The range finder affords a rapid means of getting an approximate range to an airship, so that officers can find the range quickly, make their calculations, and open fire with a reasonable chance of hitting.

—Range of

[Aeronautics. Increased Range of Anti-aircraft Artillery. Note. *Scientific American*, Nov. 13, '15. 100 words.]

At the beginning of the war, aviators considered themselves safe at an altitude of 8000 feet. To-day there is danger at 10,000 feet. This greater height makes reconnaissance difficult.

ARGENTINA

—History

[A Page of Our History.—Editorial. *Rev. Militar* (Argentina), May, '15. 2800 words.]

Orations delivered by General Ordóñez and Monseñor Zeñon Bustos y Ferreyra on the occasion of the dedication of a tablet in commemoration of those who had lost their lives in the military service of the state during the first century of its existence, 1810-1910.

ARMAMENT

See also

ARMOR

MACHINE GUNS—SHIELDS FOR

—Manufacture of

See

STEEL—USE OF IN THE MANUFACTURE OF ARMAMENT

ARMOR

See also

AERONAUTICS—ARMORED AEROPLANES

AUTOMOBILES—ARMORED

BULLETPROOF SHIELDS

HELMETS—ARMORED

SANITARY SERVICE—NAVAL

(Article: "Report on Casualties in Action Between the *Pegasus* and the *Königsberg*.)

ARMS

See

CAVALRY—ARMS

INFANTRY—ARMS

ARMY

—Organization

See also

GREAT BRITAIN—ARMY—ORGANIZATION

ITALY—ARMY—ORGANIZATION

MACHINE GUNS—ORGANIZATION

PIANELL, GEN. SALVATORE

SWEDEN—ARMY—ORGANIZATION

China and Japan

[The War Organizations of China and Japan, by Col. Von P. Wolff. *Kriegs. Zeitschrift*, Mar-Apr, 1915. 6200 words.]

Recent developments in the Far East have brought into prominence the grasping but efficient Japan on one hand and the lethargic, impotent China on the other. As a side issue, the interested but helpless America throws a tragic-comic light on the events now shaping the course of China's destiny. The United States, being momentarily occupied with a newer and very lucrative export trade, has not fully appreciated the significance of the market which is being closed to her across the Pacific. China finding sympathy but no desire for active support from the supposedly friendly America, has been thrown upon her own resources. Let us see what these resources are and compare them with those of her alert, wide-awake, but unscrupulous neighbor.

The Japanese army has been reorganized according to the experiences of the Russo-Japanese War. Every male subject between 17 and 40 is liable for service. The standing forces are filled by general conscription. In the Army, the length of service is two years for the infantry and three years for the other branches; in the Navy it is four years. Service in the first line of reserves lasts four years for the Army and three for the Navy; in the second line it is ten years for the former and five for the latter. In addition to this, there are the 1st and 2nd levies of the last reserve, consisting of those who have passed out of the reserves and those who have been excused from service.

Young men of a certain educational training are put through a course of one year with troops and then trained for the Reserve Officers' Corps. Every reservist has to complete two courses of training, lasting 60 days each.

Yearly, 450,000 men become of military age, but the annual recruit list amounts to only 130,000. The training commences Dec 1.

The non-commissioned officers are selected from especially capable privates. Owing to the high state of general education and the respect shown these offices, good men are found in plenty to fill the vacancies. The officers come largely from military academies, but some are selected from civil life on the basis of family standing and competitive examination. If an officer fails to reach a certain grade by a certain age, he goes to the inactive list. This insures a young corps of officers and provides for the Reserves. The Medical Corps has its own list ranging in rank from Lieut. to Lieut. General. The members are taken from graduated doctors and are given a supplementary training in the military medical school at Tokio.

The spirit and discipline of the Army are excellent. In this force, the government possesses a power wonderfully well adapted to its foreign policy.

For recruiting and mobilization purposes, the land is divided into districts, each district furnishing a division. The Guard Division is recruited from the whole country. In times of peace the largest unit is the division. The Army consists of 1 Guard and 18 Line Divisions. Of these the 9th Div. and a special brigade are in Korea, the 5th Div. and a brigade (assigned as a railway guard) are in Manchuria.

Each division consists of 2 infantry brigades, each brigade of 2 regiments. The regiments are made up of 3 battalions of 4 companies each and a machine gun section with 6 guns. In addition the division has one cavalry regiment of 3 squadrons, one regiment of field artillery of 6 six-gun batteries, one 3-company battalion of engineers and 2 companies in the train. The Guard, 1st, 8th and 15th Divisions possess about twice the cavalry and artillery strength of the others.

In all, Japan's army consists of 248 battalions of infantry, 89 squadrons of cavalry, 152 field batteries, 9 mountain batteries, 57 heavy artillery batteries, 57 engineer companies, 12 railway companies, 6 telegraph companies, 1 aero battalion and 38 companies of train troops.

In time of war the division is the operative unit of the Army, although several of these may be joined into a field army. Each divi-

ARMY—Continued

sion at war strength possesses 12,000 rifles, 450 sabers, 36 field pieces and 24 machine guns.

As soon as the organization established by the law of 1907 has been completed, Japan will have 1,637,000 trained men; 742,000 in the standing army, 780,000 in the Reserves, and 115,000 in the last reserve.

The Army is wonderfully well equipped throughout. It has the Arisaka rifle, model of 1905, and 6.5 mm. calibre and the Hotchkiss machine gun. The 75 mm. field guns are of a Krupp type. Ammunition is apportioned 2-3 shrapnel and 1-3 shell. The heavy artillery has 10.5 cm. guns, and 12 cm., 15 cm., and of late 20 cm. and 24 cm. howitzers.

Although every effort has been made to raise the Navy up to the standard desired, this program has met with financial difficulties. But with a population ready to sacrifice willingly to this end, a surprising development has ensued.

Since the superiority of Japan's Navy over that of China is conceded, this matter may be left out of discussion.

China's state of preparedness stands in pathetic contrast to that of Japan. The present army organization is based on the Imperial Edict of 1902. The President, Yuan Shi Kai, is credited with its reorganization.

The army is essentially professional. Length of service is 3 years with the colors, 3 in the first and 4 in the second line of reserve. Each private receives about $3.00 a month and is better found than the average laborer. The reservist receives monthly 75 cents and since he has to appear personally to receipt for the same, it is easy to keep in touch with him.

Non-commissioned officers come up from the ranks or from special schools. They are required to serve one year longer than the privates. Cadets are given a preliminary schooling, and then serve with the colors for six months, after which they take a two years' course in a military academy and are commissioned as officers. The war college in Peking offers a further and advanced school for exceptional men.

After great difficulty, Yuan Shi Kai has succeeded in putting 36 divisions into existence. Each division is made up of about 8800 effectives and 2000 supply and administrative troops, but in time of war these are increased to about 17,000 and 3,000 respectively. In July, 1914, the army is said to have consisted of 130,000 infantry, 12,000 cavalry, 17,000 artillery with 800 guns, 9,000 engineers and 8,000 train, a total of 176,000 men. At present 100,000 of these are supposed to be in vicinity of Pekin.

The equipment is variegated. Mauser rifles, models of '88 and '98, a Japanese Murata rifle and the Mannlicher appear to be the favorite weapons of the infantry. The machine guns are Vickers-Maxim. The artillery has many old style Krupp guns, 164 modern field pieces, and 250 mountain guns. Apart from these, there is a motley assortment of field pieces representing the gun-makers of the world.

In the matter of clothing, the army is better provided for. This and the recent revolution have raised somewhat the standing of the soldier among the people.

It is believed that the army might have given a good account of itself had it come to an actual invasion by Japan, but, of course, its weakness lies in the material it has to work with, the absence of manufacturing facilities, and the ill-proportionment of transport-troops considering the nature of the country.

What China will be able to do with itself and its over-ambitious neighbor is a problem that the future alone can solve.

—Organization—Swiss-Australian System

[The Swiss and Australian Systems. By Col. E. E. Hatch, Inf. *Inf. Journ.* Mar.-Apr., 1915. 10,400 words.]

Switzerland and Australia are the most democratic countries in the world. These countries have so developed progressive legislation, designed for the betterment of the greatest number, that they are models for the world. The military policy of both countries is practically identical, and fits the widely different conditions existent in these strikingly dissimilar nationalities. The system is based upon (a) more or less probable foreign aggression and war; (b) appreciation of the worth of the country and willingness to defend it; (c) duty of the citizen to the nation. This is the first duty, the rights of the individual the second; (d) economy of administration; and (e) compulsory universal military service.

The Australian military system originally comprised small forces of British soldiers supplemented by militia. The latter served voluntarily and without pay. The volunteer militia system, being expensive, unfair, and totally inefficient, was discarded in 1903. The militia forces of the six states were then consolidated into a federal force under complete control of the central government. Service being voluntary, the result was as usual a small, inefficient, and expensive force. Universal military training became a law in 1909, thus stating for the first time in an English speaking country, the principle that a citizen in return for his privileges under a government owed some service to that government. The first opposition disappeared when parents saw the improvement in health and conduct of their children, and to-day universal training is so popular in Australia that both political parties claim the credit of having inaugurated it.

Every male between the age of 14 and 26, unless exempted, is included in the citizen force. The exemptions from service are temporary and very justly made. Military instructors are furnished to the schools. Civilians may be enrolled as instructors, thereby gaining certain exemptions. The adult male population will furnish a force of 112,000 men drawn from 93 determined areas of approximately equal population. Each area furnishes one battalion of infantry of 1000 men. Battalion areas are divided into two or more training areas and are grouped by fours into brigade areas. The recruit is assigned to branch of service according to adaptability.

The citizen force is instructed by 282 officers and 425 non-commissioned officers.

Junior Cadets, from 12 to 14 years, receive a course of training covering 120 hours annually, comprising calisthenics, marching, swimming, and first aid. From 14 to 18, service in the Senior Cadets approaches the regular service as regards procedure of training and method of instruction. At the end of each year, Senior Cadets are rated as "effective" or "non-effective." Promotion is by competitive examination. Severe physical examinations keep the citizen force free from weaklings. The rejected citizens are formed into rifle clubs which constitute at present the only reserve. Discipline is secured mainly by appeal to the good sense and the patriotism of the man. Federal employ is denied to the man who defaults in any way. The Royal Military College, four year course, was opened in 1911 for the training of officers for the administrative and instructional staff.

The Swiss constitution prescribes that every citizen is liable to military duty between ages of 20 and 48. There are few exemptions. The yearly quota is examined physically and mentally. These examinations are severe, and reject about 50 per cent. Those rejected must pay a tax of from $2 to $600, depending upon income and property. Thus is exemplified the principle that men unable to perform their duty to the state should contribute financially to its support.

From 20 to 32, service is in the Elite or first line; from 32 to 40 in the Landwehr, and from 40 to 48 in the Landsturm. Recruits are called out at stated times during the year for short periods of training which vary in different branches, but which average 75 days per year.

While military service does not begin until the 20th year, the character of the public school training is such that moral and physical qualities are thoroughly inculcated, and at 20 the recruit is admirably founded in civic duty and honor. The Federal government encourages the voluntary organization of Cadet Corps; these have some 6000 members.

The first year's course in the Elite is a training period under a permanent corps of 230 federal instructors. After that, the recruit takes rifle and all equipment to his home, and is obliged to report for training, fully and properly equipped, when called. Yearly training thereafter is 14 days in the Landwehr, and none in the Landsturm except in case of war. The government pays one half the cost of a mount and returns the balance in ten installments. The mount becomes property of the man, and at all times may be used as his own. Promotion is strictly by merit. There is no political of social influence. All grades are required to attend theoretical instruction. Service in grades is as follows: lieutenant 4-7 yrs., captain 6 years, major 2 years, lieutenant colonel 2 years. Officers of the general staff are selected by the federal council by competitive examination from officers of the different arms proposed by the senior instructors.

The rifle clubs of Switzerland are a great asset to her military strength. The government in a measure controls and encourages these clubs. The military training is very practical and there are few ceremonies. Men are assigned to branches according to adaptability.

The strength of the army lies not in the system, but in the spirit of the people. Switzerland has existed since the dawn of history. To-day, surrounded by four great nations, her neutrality is respected only because she is well prepared to defend it. From her 4,000,000 population, Switzerland can mobilize an efficient army of 220,000 trained and equipped soldiers in 24 hours.

What is the application of the foregoing to the United States? The basic principle of each system is compulsory universal service, requiring a simple payment of duty or money in exchange for the liberties enjoyed under the government. At one time our army was recruited by universal conscription, but the system fell into contempt because federal and state power conflicted. If volunteers do not come forward in sufficient numbers, we must recruit for the deficiency by draft. Our army must become a great national training school. It must be made thoroughly efficient, which will require complete reorganization.

Divided control must go. The Federal government should have complete control and charge. If the Federal government withdraws its support from the militia, eventually the States will decrease the number they are willing to support. The surplus would then simply change its allegiance. Exactly as the militia stands to-day, it would be 100% more efficient under federal control.

A tax should be laid upon those citizens exempted from military duty. Training areas corresponding to congressional districts will give 2000 young men each. Making all deductions, 1-7 of these young men, mentally and physically fit, will be required yearly.

Levies should report and commence training upon a certain fixed date to economize and systematize instruction. The Swiss method of entrusting arms to the citizen is not possible except with an armed force under government and not state control. Military schools are a greater asset to Switzerland than to the United States. Both countries place their dependance upon mobile troops. Practical training must be made the rule with us as it is with them. We are slowly falling into line. Switzerland's force of 230 permanent instructors has laid and is laying deep impress upon their country's system. The fostering of rifle clubs in these countries shows a realization of the principle that "Consciousness of being a marksman is a great moral support in battle."

The vital element in any army is spirit. The spirit of the nation is reflected in the army. To adopt Swiss methods, we must inculcate the Swiss spirit. Devotion to their country is a national virtue. They have a country worth fighting for, and they are prepared to fight for it. America is worth a similar effort; America does not want war, and the maintenance of an army able to defend it is the surest preventive of war.

See also

SWITZERLAND—ARMY—ORGANIZATION

ARMY—Continued

—Pay

See

PAY (ARMY)

—Service Regulations

See also

CHILE—ARMY—SERVICE REGULATIONS

ARRAS, Battle of

—Work of Engineers in

[The French Engineers in the Battle of Arras. *Memorial de Ingenieros,* (Madrid), July, '15. 1500 words.]

For many months the French engineers had been assisting the infantry in the construction of trenches, especially in the Carency section. Galleries were prepared towards the salients of the enemy's lines, for the laying of mines. In February an explosion revealed a system of countermines laid by the Germans, and prisoners confirmed the deductions. Defensive precautions were taken on the front line by constructions which permitted the avoiding of the German approaches. [Details not given.—ED.]

In the first part of May, after several minor incidents, 17 mines containing 300 kilograms of explosive each were placed below the German trenches. The explosion of the German mines had caused little damage, but, on the contrary, had served as guides in the French construction.

From the 6th of May to the beginning of June the total development of French galleries and branches in the Carency sector amounted to 2500 meters and the amount of explosive used was 28 tons. The German defenses before Carency and as far as Targette were powerful. There were many lines of trenches, carefully constructed and reinforced, with excellent communications from Souchez. Defensive mines were laid to stop the French attacks.

French infantrymen from the mining regions were utilized in constructing approaches and mines for attack.

On May 9th, after weeks of careful preparation, the French opened a furious bombardment early in the morning, and 17 mines were exploded simultaneously in the Carency sector. The infantry attack was launched immediately after, with effective results. The German trenches were almost obliterated, and the craters and mounds formed by the explosion of the mines offered the attacking troops good shelter. The wire entanglements had been cleared by the artillery and mines. Many of the German mines were rendered ineffective by the cutting of the cable communications.

In other parts of the front similar operations were undertaken with good results; and in less than twenty-four hours nine kilometers of German front had been occupied, the trenches reconstructed, and communications well established.

ARROWS, Aero

See

"FLECHETTES"

ARTILLERY

See also

ANTI-AIRCRAFT ARTILLERY
COAST ARTILLERY
EUROPEAN WAR—LOSSES—FROM ARTILLERY AND INFANTRY FIRE RESPECTIVELY
FIELD ARTILLERY
FORTRESS ARTILLERY
FUSE SETTER
MACHINE GUNS
MOUNTAIN ARTILLERY
NAVAL ARTILLERY
SIEGE ARTILLERY

—Combat

See also

MACHINE GUNS—FIELD USE OF

—Fire

[The Remaining Velocity and Penetrative Power of Armor Piercing Shell. By Captain H. J. Jones (I. O. M.), A. O. D. *Jour. Royal Artillery,* July, '15. 2000 words. 4 diagrams.]

For the technical ballistic computations by which the results indicated in this article are arrived at, reference should be had to the complete article.

A chart is given showing the relation between caliber and muzzle velocity of the gun, thickness of K. C. armor penetrated, and range, for both normal and 30° impact. By means of this chart we are enabled to see at a glance the thickness of plate perforable at any range by guns from 7".5 to 14" caliber, and having a muzzle velocity from 2200 to 3000 f. s.

The diagram for normal impact may be looked upon as furnishing a guide to the offensive powers of various guns at various muzzle velocities.

The diagram for 30° impact may be considered as a guide to the limit of range at which guns may be expected to do effective work against a specified nature of armored defense.

[Fixed Armament: Firing with Vertical Base. By M. A. H. Hazen, 1st Lieut. of Artillery. *Indisch Militair Tydschrift,* No. 7. July, '15. 4500 words. One drawing.]

(The technical methods for carrying out the regulations for Fixed Artillery Fire are given in the full text, to which reference must be made for these methods.)

See also

BALLISTICS
PROJECTILES—SMOKE TRACING AND ILLUMINATING

—Fire—Attack Under—By Infantry

See

INFANTRY—ATTACK—UNDER ARTILLERY FIRE

—Fire—Ear Protection Against

See

EAR PROTECTION—AGAINST ARTILLERY FIRE

—Fire—Efficiency

[Artillery and Infantry Fire Effect. Editorial. *Artill. Monatshefte.* Jan 1915.]

After the Manchurian War it was maintained that artillery shrapnel fire was a failure. During the present war, artillery fire has shown a decided superiority over infantry fire.

A French surgeon reports cases under his care 60% due to artillery fire; 32% infantry fire; and 8% unknown.

—Fire—High Angle

[Modern Heavy Ordnance for High Angle Fire. Anonymous. *Kriegs. Zeitschrift,* Mar-Apr, '15. 2000 words, 3 photo-prints.]

The principle of long recoil has not only been incorporated in all modern field pieces, but has found application in the heavy siege howitzers and mortars as well. These pieces were first developed within the limitations of wheeled carriages. The 305 mm. Austrian mortar and the 420 mm. German howitzer presented problems beyond the limits of wheeled vehicles, and in these pieces the ordnance designers have had to revert to a shorter recoil and a more solid foundation.

The element which retarded the development of heavy mobile artillery for some years was not the question of recoil so much as that of wheel breadth. French designers sought to increase the tire width by using a broad tread made in sections, which could be fastended on the wheel whenever the occasion demanded. This device was not a success. Later an Italian invention found universal approval. Its first use was found on the "caterpillar" type of tractor, and consists of a number of pads linked together. The vehicle practically lays its own track. This principle was quickly seized upon and applied to the heavy siege pieces.

Although the wheeled carriage has the advantage of being more readily placed in action, this seems to be its only point of superiority over the carriage on a fixed foundation. And it is doubtful, if it even were practicable, whether the heaviest pieces would have been mounted on a wheeled carriage. The latter is limited in traverse to about 7°, is more readily thrown out of level during fire, and has not the rugged construction necessary for a weapon of this type. In order to reduce its maximum load weight to 11,000 lbs., the designer has had to cut down weight to the very lowest limits of safety.

The carriages on a fixed foundation have a traverse of about 30°, are not materially thrown out of adjustment during fire, and are rigidly enough constructed to avoid all danger of damage to material. Here, of course, the problem of a proper foundation offered the greatest difficulty.

However, it is wrong to assume that one should choose either one or the other. Both types of carriage are necessary. The single element of rapidity in going into action justifies the use of the wheeled piece. It is false to assume that because this one type has but one advantage to three for the other the latter should be adopted exclusively. In the present war, it is only the wheeled carriage that has made it possible, in many cases, to bring up the heavier pieces at all.

—Fire—Long Range

[Current Notes on the War. The Bombardment of Dunkirk. Editorial. *Artill. Monatshefte,* June, '15. 4500 words (total).]

The long range bombardment by the Germans with 38 cm. guns has done great damage to the city, evidences of destruction being seen everywhere.

[Long Range Artillery Firing. Comment. *Army & Navy Jour.,* July 3, '15. 250 words.]

The London *United Service Gazette* comments on the very long ranges at which firing is done on both sea and land. The latest 15-inch naval guns have a maximum range of over 24,000 yards, limited by the elevation of less than 15° permitted by present mountings. The maximum theoretical range is about 46,000 yards.

The Germans have bombarded Dunkirk with guns emplaced near Dixmunde, at a distance exceeding 23 miles.

—Fire—Long Range—With Medium Calibre Guns

[Current Notes on the War. Editorial. *Artill. Monatshefte,* June, '15. 4500 words (total).]

On their first retreat from Mülhausen to Belfort, the French destroyed the large viaduct across the valley of the Larg at Dammerkirch in Alsace. When they again advanced, this viaduct was rebuilt with much labor. On May 31, 1915, the Germans, with the aid of aeroplane reconnaissance, firing at a range of 12.4 km. with 15 cm. guns obtained a direct hit on the third shot. In all, 51 shots of different caliber were fired at Dammerkirch, demolishing the reconstructed viaduct and most of the houses in the village.

—Fire—Over friendly troops

[The Fire of Artillery Over Its Own Troops. By the First section of the Central School of Fire of the Army. *Memorial de Artilleria,* Mar 1915. Madrid. 7000 words. Extract from range tables.]

The fire of artillery over friendly troops is treated under two general heads.

1st. Supporting the Attack.—Intensify the fire when the attacking troops disclose themselves, continue it until almost the last moment, than raise the range firing against hostile forces behind the first line. Our losses from abnormal and erroneous shots will be trifling compared to those inflicted by an enemy freed from such an artillery attack by the premature cessation of its fire.

Masked batteries firing over troops in their immediate front must subject them to no danger.

When to increase the range, and the extent of the danger space in their immediate front are matters which fire directors must know perfectly.

The solution of the first of these two questions depends upon the kind of fire employed. Assume as a basis for its calculation for both percussion and time fire, the minimum range to be 1500 m., $\varepsilon = 0$, and a terrain horizontal at the target, then the problem for percussion fire may be solved by an inspection of the ordinates of the 1500 m. trajectories for both the 7.5 c. m. and the 7.0 c. m. guns. Take the ordinate whose height is not less than twice that of a mounted man, 4.8 m., as the most advanced vertical limit of the safety zone; its

ARTILLERY—Continued

corresponding abscissa, 1300 m., marks a point 200 m. short of the target, moving this back 100 m. to provide for probable errors of guns determines a danger zone for the attacking troops of 300 m. width. Upon their arrival at this distance from the hostile position the range of the artillery fire must be raised.

500 m. from the target is the corresponding distance for time fire, a result obtained by considering in addition to the above cited assumptions that the bursting interval is a maximum, of such a height that the striking energy of the shrapnel ball of least trajectory will be sufficient to wound seriously the personnel, that is, 16 kgm.

By means of the formula $XB = X'B \frac{\sin\omega}{\sin(\omega+\rho-\varepsilon)}$ the aforesaid distances may be converted into XB for various values of ρ (slope), ε and ω. XB represents width of danger zone in question. The information that the attacking troops have reached the limit of the danger zone should be communicated to the supporting batteries by means of a carefully prepared and previously agreed upon system of signals. Batteries considerably to the rear assigned to the support of the attack obtain such information from the batteries of accompaniment; when this is impossible, they may "stake out" the danger zones by percussion fire at ranges 200, 300 and 500 m. less than that of the target. The entrance of the infantry into these zones should be signaled to the battery commanders by their own distant lateral observing stations. A captain's principal reliance, however, may have to be his own accurate observation, prompt decision and coolness.

2d General Heading. A masked battery must not fire unless the space for 500 m. in its immediate front is unoccupied by friendly troops; a limit determined from the hypotheses previously assumed in regard to the values of the range, of ε, and the character of the terrain, also that the minimum ordinate be not less than 12 m., 6 times the height of a mounted man, and that the striking energy of shrapnel balls from muzzle bursts be not greater than 3 kgm., that is, harmless to the personnel. This limit is not to be decreased, but becomes 800 m. for $\varepsilon=10$. Limits of safety zones prescribed in Italian, French, German, Swiss and Japanese Artillery Regulations approximate more or less closely those cited above.

—Life of

[Wear of Guns. By First Lieutenant Harald Hansen. *Norsk Artilleri Tidsskrift,* Jan to Apr, '15. 4000 words. 2 tables, 6 plates, 8 photos.]

The wear of English, French and German guns, and of Schneider, Armstrong, Ehrhardt and St. Chamond types, is graphically illustrated by curves representing conditions before firing, after firing six to eight trial shots, and after several years' use. The Schneider pieces show but a small change in caliber. The bore of this type consists of a solid core running the full length of the barrel. The Ehrhardt shows a noticeable wear near the breech, probably due to "burning" and also probably to "wobbling" of the projectile before its perfect centering in the rifling.

Generally the causes of the change in the caliber of all the pieces are:

(1) corrosion; (2) wear by cleaning piece; (3) wear by the friction of the projectile and oscillation of same in the bore; (4) structural change of material in the core at firing; and (5) "burning out."

Corrosion should not appear in well kept pieces, though in wet weather rust may fasten itself and pit the bore. Where tompions are used, corrosion may show near the muzzle, probably because a wet tompion is placed in the muzzle after practice in damp weather.

Wear due to cleaning should be very slight.

The greatest wear is caused by actual firing. The lands are most affected. In a number of pieces, these were flattened due to the oscillation of the projectile in the bore. This oscillation, combined with the vibration of the barrel, hammers and deforms the lands.

Structural change due to firing, which causes the metal to flow, may cause reduction of caliber in spots, and may be so great that the caliber of the bore becomes less than that of the projectile. Such impediment to the projectile may cause it to explode in the barrel.

An attempt is made to explain in part the change of caliber due to "burning."

"At the explosion of the powder gas, the bore is strongly heated. This causes an expansion of the surfaces exposed to the action of the hot gases, while the outer material is not affected and resists the expansion. A flow of the heated metal occurs, and the material fails to return to its former volume after cooling."

[Notes of the War. *Army & Navy Jour.,* Oct 16, '15.]

An English naval writer states that ships at the Dardanelles are still using their turret guns after firing 200 and even 300 rounds. The "life" of a heavy naval gun had been formerly believed to be about 100 rounds.

—Manufacture of

See

STEEL—USE OF IN THE MANUFACTURE OF ARMAMENT

—Tactics—Co-operation with Infantry

See

INFANTRY—TACTICS — COOPERATION WITH ARTILLERY

—Use of in Balkan Wars

[The Artillery in the Balkan War. By Capt. Emil Kraus, 14th Austro-Hungarian Field Artillery. *Mitteilungen über Gegenstände des Artillerie und Geniewesens.* Jan., 1915. 5000 words, 5 sketch maps.]

The Balkan War of 1912-13 has emphasized the importance of artillery in modern battle. Even the best infantry is helpless without artillery support. All the belligerents had modern rapid-fire field guns, though some older types were also in use. The Turks used

Krupp guns with spring return. The other belligerents used Schneider-Creusot guns with pneumatic counter-recoil mechanism. Divisional artillery consisted of one artillery regiment of three battalions, each of three batteries. The Turkish battery consisted of 6 guns and 9 caissons, that of the other armies of 4 guns and either 9 or 12 caissons. Information is not complete, but it is known that Krupp 10.5 cm. guns and 15 cm. howitzers, and Schneider 12 cm. guns and 15 cm. howitzers, generally of the older types, were used.

From a study of the engagements at Elasson, Sarandaporon, Hadora, Janica, and Kumanova, the following conclusions and lessons may be drawn:

The flat trajectory field gun fulfilled all expectations. Its accuracy was excellent, and the material was still in good condition at the conclusion of the war. The pneumatic counter-recoil mechanism stood the test well.

The artillery soldier must be thoroughly trained in the service of the piece. Artillery commanders must know where and how to post their batteries, and the powers and limitations of artillery. This was not always the case in this war. The Greeks fired at excessive ranges. Frontal shrapnel fire was frequently used against shielded batteries without effect, and likewise at short range against intrenched infantry. Points of burst were too high, and, as a consequence, shrapnel bullets had insufficient penetration. This caused percussion shell to be given the preference. The excellent cover afforded by shields against such fire was clearly demonstrated.

The most serious wounds were produced by hand grenades, the next in order by artillery projectiles, and the least serious by small-arms bullets. Personal cleanliness is important as a protection against infection of wounds.

The moral effect of artillery fire was tremendous, much greater than that of infantry. Artillery often had to go into position when it could do little beyond raising the morale of its infantry.

An attack against an opponent possessing intact artillery leads to disaster.

Turkish batteries generally fought in unmasked positions on high ground, their limbers posted 300 paces in rear. It was an easy matter to silence these batteries. Their teams were generally hit by the fire directed at the firing batteries. In consequence, a large number of guns fell into the hands of the enemy. Difficulties were encountered in firing on masked batteries. An area was searched by progressive fire until the hostile fire was silenced. To deceive their opponents, the Greeks then made it a point to deliver a hot fire from batteries that had remained untouched.

As patrols were frequently captured, observation had to be supplemented by aerial reconnaissance made by trained artillery officers acting as observers. Fire was directed against hostile observing stations.

Mountain guns were found useful, especially in accompanying infantry attacks. Field artillery moving on a single road frequently hampered the movement of other troops. Heavy artillery fully justified its existence. The Serbians prefer the heavy gun to the howitzer. The introduction of a gun of 10 cm. caliber is at present contemplated.

In defense, whenever time permitted, telephone communication was used with success. This was not true in attack, however, because the wire carried along was soon exhausted. Visual communication was not reliable. Weather conditions frequently interfered. During the stress of action, it was difficult for observers to differentiate between their own signal stations and those of other batteries. Both mounted and dismounted orderlies should be kept in readiness at all times.

Observation ladders were used extensively by the Serbians, even in the mountains where elevated observation points were not lacking. The other armies were not equipped with such ladders. Observation stations of battery commanders should not be too far from their batteries.

Mechanical range finders and a careful use of maps reduced the time for adjustment; 120 rounds per gun were found sufficient even in a protracted engagement.

As changes of position could not be effected with the aid of teams in many instances, a contrivance enabling the personnel to move the pieces by dragging would have been useful.

The artillery might be handled in attack as follows: the heavy guns to open fire on the hostile artillery at a range of from 8 to 10 km. Under cover of this fire, the light guns and howitzers should go into covered positions and combat the hostile artillery from different directions, bringing oblique and enfilade to bear if practicable.

When the decisive infantry attack begins, all fire should be concentrated against the point of attack, eventually at ranges under 2000 m. Batteries should be detailed to take care of the hostile artillery, in order to keep its fire down and thus protect the attacking line. When the artillery is numerous, batteries should be assigned to the various attacking groups.

Batteries—if necessary, of mountain guns—broken up into sections, should closely follow the attacking line to short range to give moral support to the infantry, and particularly to combat machine guns.

No hard and fast rules can be prescribed. Each combat is a separate problem. Experience gained on the target range, and ingenious theories evolved during long periods of peace, should not be applied arbitrarily in practice. The important thing is to have a thoroughly trained corps of officers, willing to shoulder responsibility and capable of adapting itself to any and all situations.

—Use of in European War

[Contemporaneous Notes on the War. Editorials. *Artill. Monatschefte*. Feb 1915. 4500 words.]

Losses to Feb, 1915. Field Artillery—1846 officers; 28,766 men. Foot Artillery—215 officers; 4120 men.

High Bursts. The French are advocates of shrapnel zone fire, therefore their fire is apt to show very high bursts. The mistake usually made at the firing point is to judge the

ARTILLERY—Continued

bursts too low; this will of itself produce high bursts.

French Heavy Artillery. At the beginning of the war the French were decidedly inferior in heavy artillery to the Germans, the relative strength being as 24:80. This deficiency has been overcome by confiscating all guns and ammunition in private ordnance manufactories which had been ordered prior to the war by foreign nations and by impressing into service obsolete guns or guns from unthreatened fortifications. The result is a very motley armament but it shows how important is the development of private ordnance industries.

French shrapnel. The French use two kinds of shrapnel with their 75 mm. gun, one is base charged, painted red and contains 261 bullets; the other has the bursting charge intermingled with the bullets, is painted white and contains 290 bullets. Both weigh about the same, 7.25 kg.

Unit Projectile in France. The report that the French are relying almost entirely on melinite high explosive shell should be accepted with great caution; this report may refer to the introduction of a unit projectile.

Ammunition Deficiency. It is reported that France is experiencing a great deficiency in heavy artillery ammunition. Had 2000 rounds at the outbreak of the war. 42 large lathes for manufacturing ammunition have been recently ordered in the United States.

Italy. It is reported that Italy has completed the armament of its Field Artillery with the new Deport gun (split trail). The old Krupp 75 mm. guns are to be transferred to the reserve corps. Both guns use the same ammunition. Great advance has also been made in the manufacture of heavy artillery matèriel and machine guns.

Science and Artillery. Mathematics and science have had a great influence on the present artillery warfare. From a shell fragment it is possible to tell the caliber of the gun. Many persons still doubt the existence of the 42 cm. mortars. In the Military Technical Academy, Berlin, the Germans have a completely equipped plant to carry on technical experiments of military value.

[Current Field Artillery Notes. Editorial, *Field Artillery Journal.* Apr-June, '15. 2000 words.]

French 105 mm. guns are organized into four gun batteries, three batteries to a battalion. Projectile weighs 36 lbs., maximum range 15,000 yds., weight of piece limbered 5720 lbs. The principles of construction and the control of recoil are the same as in the 75 mm. gun.

For *interior communication in brigades,* the following equipment has been adopted by the U. S.: new form of buzzer with both telephone and calling buzzer, five line switchboard, one mile field wire, which will be sufficient for three regimental and two outpost lines.

Flashless powder tests made at Ft. Sill are satisfactory. Extensive tests will also be made with aeroplane at Ft. Sill, and with new signal equipment at Tobyhanna.

[Field Artillery Notes on the War, Editorial. *Artilleristische Monatshefte,* May, '15. 3000 words.]

Austrian Heavy Artillery. The Austrian 30.5 cm. motor mortars were fully tried out before the war and their superiority to the Russian heavy artillery was known. Great use was made of heavy artillery in the defense of Cracow. At Przemysl. Austrian aeroplanes co-operated with the heavy artillery in attacking Russian batteries and reserves. Russian heavy artillery fire was ineffective against concrete fortifications. It is said the Austrians will develop their heavy artillery still further.

American Ammunition. French reports say that the American ammunition is very satisfactory.

New French Projectile. The French have adopted a new 75 mm. turpinite shell armed with a combination fuse. The old melinite shell had only a percussion fuse with delay action, its angle of opening being 130° and radius of effect 20 m. The fuse was not inserted until immediately before time for firing. Frequent failures to burst on soft ground were noted. These defects will be corrected by the new combination fuse. Some appreciable time will elapse before the orders placed in America will begin to arrive. The new projectile can hardly be superior to the light gun shell and is inferior to the light howitzer shell.

Long Ranges. It was stated that Krupps have a gun which will fire 42 km. This has been substantiated by the long range bombardment of Dunkirk in May, 1915, presumably by 30.5 cm. and 38 cm. guns, the range being about 35 km. The guns were probably mounted on special carriages with an elevation exceeding 30°. Aeroplanes co-operated in the observation. At the range indicated, the target was 120 m. below the horizon due to curvature of the earth.

General v. Jacobi. The first chief of the Prussian Field Artillery, died Mar. 23, 1915, in his 85th year. He was a veteran of the Franco-Prussian, Austrian and other wars. As chief of artillery, he was chiefly responsible for the great progress made in firing practice, improvements in material, the proper tactical organization of the field artillery, and its assignment to divisions.

Krupp. The works at Essen are kept going night and day throughout the year. 50,000 men working 8 hours per day are employed, most of whom are excused from military service. Essen is protected by anti-aircraft guns.

Shields. On the western front French infantry men are using shields. 10,000 have already been provided.

The French 75 mm. gun has made a wonderful impression upon the French people. The idea of a long recoil field gun was patented by Haussner, a German engineer. In 1892 Col. Deport learned of this patent and de-

veloped the idea. Experiments were completed in 1894, after which Deport applied for retirement and entered the employment of the Châtillon-Commentry Works. Subsequent service tests were carried out by Capt. St. Clair Deville, who was later assisted by Capt. Rimailho. The former perfected the hydraulic-pneumatic recoil system, invented the upset caisson, the pointing mechanism, and the fuse setter. Gen. Deloyé was in charge of the final tests and the introduction of the gun in 1898. He organized a press bureau to deceive foreign nations. Gen. Mercier invented the fuse. The organization of 4 gun batteries was opposed by Gen. Langlois.

[Effects of Shell Fire at the Front. Anonymous. *Sphere*, May 22, '15. 200 words. Illustrated.]

After describing the craters formed by the various caliber shells, the following is quoted from the *London Times*. "The fighting has been so complicated and positions have changed so often that it is practically impossible to tell with any exactness by what troops they were occupied, which sheltered defenders and which the attack, from which the shells were fired. Only the general position and direction is clear, only the general destruction remains."

[Current Notes on the War. Editorial. *Artill. Monatshefte*, June, '15.]

The Archduke Frederick has issued a special order to his army commending the splendid achievements of the German and Austrian artillery and their sacrificing but effective support of the infantry.

—Wire-wound Guns

[Wire-Winding Big Guns for Uncle Sam. By Chester L. Lucas. *Scientific American*, May 22, '15. 2000 words. Photos. and diags.]

The use of wire-wound guns is old, probably extending back to Gustavus Adolphus. The principle is that of an initial strain of compression, the same as that employed in built-up guns, and experience has proved that this lengthens the life of the weapon.

Two systems of winding are employed: One consisting of a succession of layers wound at the same tension, and the other of an increasing tension in the successive layers. About ten layers are employed, the reinforcement being heaviest at the breech. Covering tubes are placed over the wire, and each of these tubes is "stepped" to give it a bearing on one of the inner tubes as well as on the wire.

ASPHYXIATING GASES

[Antiquity of Military Asphyxiation. *Army & Navy Register*, May 29, 1915. 250 words.]

The employment of gases to poison the enemy by the Germans is new: but the process had been suggested before, as may be seen from the records of the Board of Ordnance and Fortification, War Department. The gases were to be contained in bombs to be thrown within the hostile lines, with effects varying from sleep to instant death.

[The Double Rôle of Chlorine in War. *Boston Medical and Surgical Jour.*, July 1, '15.]

Chlorine gas is called the Dr. Jekyll and Mr. Hyde of War. Used on the one hand to purify drinking water, it drops its habit as an angel of mercy to become a demon of destruction.

The Sanitary Corps of armies have recently very successfully used the liberation of nascent chlorine gas in water to destroy bacteria. One part of chlorine in 500,000 to 7,000,000 parts of water will render water germ free and potable.

The deadly activities of chlorine were brought into notice last April when it became known that the Germans were using an asphyxiating gas, greenish in color and somewhat heavier than air, which was allowed to drift toward the attacking forces when the wind was favorable. Death occurs from asphyxia; those who live and suffer ill effects, are afflicted by a more or less purulent bronchitis. Oedema of the lungs has been present in all cases at autopsy.

[Asphyxiating Gases. By N. L. Hansen. *Dansk Artilleri Tidsskrift*, Sept., '15. 1850 words.]

The world has witnessed with astonishment the method of fighting with asphyxiating gases which has now come into use. Information as to the chemical composition of the gases is only available in the papers and reviews of the Allies, as the Central Powers are silent. It is, however, mostly the result of the examinations of the victims which has cast a light on the nature of the gases used. Chlorine and bromine fumes are mostly used, or a mixture of the two, but sulphurous anhydride (SO_2) nitrous acid (N_2O_4) and carbonyl chloride ($COCl_2$) have also been traced.

As to how it is brought into play, it would appear that stationary works have been built at the western front from which the gases are led through pipes to the trenches; when the wind is favorable valves are opened and the escaping gas drifts towards the enemy. Transportable reservoirs are also used containing the gases in compressed form. It is a common feature of all these gases that they are easy to produce and to compress to liquids; they have a high specific gravity which enables the poisonous clouds to remain concentrated for a considerable time. At a distance of 2 to 3 km. from the source the fumes are not dangerous, but much depends on the wind and the conformation of the ground.

If a man poisoned by chlorine escapes death on the battlefield, a long, slow bronchial illness ensues, accompanied by great difficulty of breathing. Poisoning by bromine has a similar effect.

Sulphurous anhydride, SO_2, like chlorine and bromine, has a pronounced irritating effect on the respiratory system; in the lungs it is oxidized to sulphuric acid which may result in death by suffocation owing to its influence on the oxygen of the oxyhomoglobin of the blood.

ASPHYXIATING GASES—Continued

Nitrous acid, N_2O_4, produces a local irritation of the mucous membranes resulting in swellings in the upper bronchia, with mortal result. It also has a strong effect on the central nervous system, the breathing centres and the action of the heart. A characteristic feature of this form of poisoning is that the victim, after having recovered from the first disagreeable effects, feels all right for several days but suddenly becomes seriously ill again.

As a preventive against these gases an alkaline solution of natrous thiosulphate ($Na_2S_2O_3$ $5H_2O$) is used, which, owing to its alkalinizing effect on the poisonous gases, neutralizes those containing acids. The natrous thiosulphate is used to counteract the two gases most employed—chlorine and bromine.

A protective mixture of hyposulphite of soda and bicarbonate of soda is also used as a dry mixture, placed in a packing which is moistened before use and then placed before the mouth as a mask. The mask covers the whole face, with glass or celluloid in the eye openings. When no absorbent materials are at hand, a tuft of hay or straw is moistened and kept before the nose and mouth.

The packing at present used by the English contains 10-15 grammes of a mixture of 72% thiosulphate and 28% bicarbonate of soda, which affords protection for a man for about 2½ minutes when the air contains 10% chlorine and twice as long with 5% chlorine.

See also

AERONAUTICS—PROTECTION AGAINST AERONAUTIC ATTACK
RESPIRATORS

—Hand Grenades for

[Asphyxiating Hand Grenades. *Army & Navy Jour.*, May 8, 1915. 250 words.]

The French propose to use a hand grenade filled with chemicals which will produce a gas causing temporary paralysis of those inhaling the fumes, but having no deadly effect.

France

[Current Notes on the War. New French Gas Bombs. Editorial. *Artill. Monatshefte.* June, '15. 4500 words (total).]

It is reported that the French are manufacturing a trench grenade which, upon striking, liberates a chemical lignia giving off a gas that excites the lachrymal glands to such an extent as to impair vision.

—Physiological Effects of

[Observations on 685 cases of Poisoning by Noxious Gases Used by the Enemy, J. Elliot Black, Elliot T. Glenny, and J. W. McNee Lieutenants R.A.M.C. with a note by Col. Sir. Wilmot Herringham, British Forces in France. *British Medical Jour.*, July 31, '15. 4000 words.]

An interesting article to medical officers. It is in effect what one might expect to result from a partial suffocation with chlorine gas. Some treatment and pathology are given. No preventives mentioned.

—Use of in European War

[Suffocating the Enemy. *Literary Digest,* Mar 8, '15. 2100 words.]

[Newspaper comments on this new mode of offense. Sir James Dewar, P.R.I., is quoted as saying that the Germans undoubtedly have hundreds of tons of chlorine available, that they have been manufacturing it for years in tremendous quantities.]

Dr. John S. Haldane, who was sent to France to observe the effect of the gases used by the Germans, reported Apr 28 that death was due to acute bronchitis and its secondary effects. There was no doubt that the bronchitis and accompanying slow asphyxiation were due to irritant gas.

"These symptoms and other facts so far ascertained point to the use by the German troops of chlorine or bromine for the purposes of asphyxiation. There also are facts pointing to the use in German shells of other irritant substances.

The condition of a Canadian suffering from the effects of the fumes is thus described: He was blind and for a time dumb. His blindness is apparently only temporary—occasioned by shock. His tongue is swollen to nearly double its normal size, blotched with black patches, and badly ulcerated underneath. The membrane of the mouth and throat is excessively inflamed. The lungs are attacked, and a very severe bronchitis has been set up. His pulse is no more than a faint flutter. His temperature is high and his respiration labored and difficult. His arms and legs had turned a mottled blue, or rather violet. This was due to the inhalation of the fumes preventing the proper oxidization of the blood."

One day's appeal through the British press Apr 28 gave the army all the respirators needed.

[*Information*, May, '15.]

The official Belgian committee appointed to investigate reported violations of the laws of nations made a report Apr 29. It was stated that gaseous clouds extending 300 feet into the air were carried away from the German lines by the wind. The clouds were green in color at the base, gradually shading to light yellow toward the top. Several kinds of gases appear to have been used, including chlorine, the nitrous vapors of sulphurous anhydride, and others, the nature of which has not yet been determined.

Four methods were employed in generating these gases. The first was to light fires in the first line of trenches and permit the wind to blow the gas formed toward the Allies' lines. The three other methods involved inclosing the gas in some kind of missile. These included cans thrown either by hand or by mine howitzers, cylinders of compressed gas and shells containing compounds which were transformed into gas when they exploded.

The effects of the fumes were felt a distance of half a mile. They produced a kind of stupor, which lasted for three or four hours.

A German prisoner said that gas cylinders were placed along the entire front held by the 16th corps. There was one every six feet. Men especially instructed in their use

were provided with smoke helmets, while all the soldiers had respirators served out to them.

[Effects of Asphyxiating Gas. Anonymous. *Sphere,* May 29, '15. Note. Illus.]

The usual method of attack is to subject the opposing trenches to a severe bombardment and then bring the gas cylinders into play. After allowing sufficient time for the gas to drift into and past the trenches, the infantry advances to the assault.

[Notes on the War in Europe. *Army & Navy Jour.,* May 1, 1915.]

The asphyxiating gas used by the Germans (chlorine) is contained in steel cylinders under pressure. It is compressed under high pressure in reinforced bottles and liberated when the wind is favorable. Being heavy, the gas spreads along the ground without being dissipated.

[Asphyxiation Gases. *Army & Navy Register,* May 8, 1915. 270 words.]

A dispatch from Sir John French, May 3, states that the Germans use pipes laid in the trenches to discharge asphyxiating gases; and besides use shells manufactured *ad hoc.* German troops attacking under cover of these gases were provided with respirators. Since first used, the method has been followed in offense and defense whenever the wind served. These gases produce acute suffering and a large proportion of the victims die a painful and lingering death. Survivors will probably be invalids for life. It is believed "that the use of these gases will be the normal procedure of the enemy and that protests are useless."

[German Use of Asphyxiating Gas. *Army & Navy Register.* May 29, 1915. 550 words.]

According to an eye witness, the Germans intending to make an attack near Ypres on April 20, waited until the 22d when the wind began to blow from the north. Between 4 and 5 P. M. they released a cloud of poisonous vapors which rolled swiftly toward the French lines. Under cover of this they reached the enemy reduced to a state of non-resistance and pushed their way through the gap thus created. The Germans it is said were protected by pads soaked in a solution of bicarbonate of soda.

[Employment of Asphyxiating Gas. From *Le Temps* of May 9, '15. *Army & Navy Register,* Aug 28, '15. 900 words.]

From the report of a commission ordered to investigate the subject of the employment of asphyxiating gases, published in the Official Journal, the first use of this gas was made by the Germans on April 22 on the line between Bixschoote and Langemarck. The use and effect of this gas are described. Other instances of its use occurred on April 27 and May 2. Complete apparatus had been prepared for its use, and the troops intended for the accompanying attack were provided with respirators. The French learned of the existence of the plan for the use of gas through the declaration of a prisoner on April 14. The gas has been determined to be chlorine.

See also

EUROPEAN WAR (Article: "Scientific and Engineering Aspects of the War.")

ATTACK

—Use of Reinforcements in

[The Reinforcement of the Firing Line in the Attack. Trans. from *Jour. des Sciences Militaires,* by 2d Lieut. L. H. Drennan, 4th Infantry. *Jour. Military Service Inst U S,* Jan-Feb, '15. 4500 words; Mar-Apr '15, 2500 words.]

The subject is treated in seven chapters as follows: I. Rôle of Reinforcements; II. Distribution; III. March; IV. Methods; V. Execution; VI. Reinforcements at Moment of Assault; and VII. Reinforcements in the Decisive Attack.

I. Rôle of Reinforcements.

Infantry begins to lose materially and morally, from the time it comes on the battle field, the moral loss being due to the enormous nervous tension that the exigencies of modern combat have pushed to the extreme human limit. The danger to which the men are subjected is continuous and of long duration and the anxiety increases as the fight progresses. In unsuccessful troops this is accentuated. An engaged unit has a limited offensive capacity and there arrives a moment when it is incapable of advancing by its own efforts. At this moment it becomes necessary to smother the adversary by increased fire and new rifles must enter the line. The proper deployment of these reinforcements is important. Will they be sufficient to make a forward movement again possible? During the movement of reinforcement and advance all the rifles of the opposing line must be covered by fire from those units not moving. At close range it is practically impossible to change sectors, and to do more than compel the individual to fire on the target directly in front of him. As a consequence the assailant sends fewer projectiles than the same strength on the defensive, and at times parts of the defensive line are entirely free from the fire of the attack. It thus occurs that, if the artillery is unable to assist, the moral superiority must rest with the assailant,—the numerical strengths being equal. Reinforcement is necessary, then, for the forward movement, and the support of artillery and machine guns is absolutely requisite. The reinforcements will have for their principal objects 1, to repair material losses; 2, to add fresh energy to the firing line. They can offset a sudden recoil, replace troops engaged and go beyond them, occupy points vacated by the enemy, cover the flanks, and gather the fruits of victory.

II. Distribution of Reinforcements.

Contrary to the Napoleonic idea of dash and smash at all periods of the fight, infantry must be schooled to slow guelling losses

ATTACK—Continued

up to the moment of assault, when comes the time for the smash. Hence the rôle of supports is now essentially different. The fighting front, though now more extended, must nevertheless be proportioned to the force it represents. The German regulations of 1906 require that the terrain shall not be so crowded as to interfere with fire yet hold to the principle that it is impossible to attack too strongly. Hence it is deduced that, (a) the disposition should be deep, giving progressive intensity to the attack; (b) uniform disposition is not to be sought, but the commander must decide where to throw the greatest weight; (c) reinforcements must be made at points promising success, but these are generally where the supports can reach the line with smallest loss; (d) the local commander must know definitely how much support he can count on.

III. March of Reinforcements.

Men must arrive on the line in condition to fight, and must avoid the hostile artillery, as well as direct and indirect infantry fire. This latter cannot always be avoided as the supports approach the line, though the enemy instinctively directs his fire on the most prominent groups, which are those of the advanced line.

To avoid artillery fire the units are disposed in small columns separated by distances and intervals such that the sheaf of fire of any one shell or shrapnel cannot reach two fractions at once. A checkerboard formation is best, a fraction marching directly in the trace of a preceding one being at a distance of 150 to 200 meters, and the intervals being from 30 to 60 meters. This applies to a regiment having two battalions in the firing line and one in reserve, except that the reserve battalion should follow at 400 to 500 meters.

Due to the range and flat trajectory of the high power infantry rifle, the distances should be diminished after entering the zone of infantry fire, and especially on nearing the firing line, since a difference of a few meters makes no difference in effect, and other considerations govern. By taking advantage of accidents of terrain the reinforcements draw up, and the elements nearest the firing line must always be within reach.

The formations in column assure efficiency. Under cover they advance in quick time. In the open they rush, and at each halt take the prone position and throw up protection if they are to remain any length of time.

IV. Methods of Reinforcement.

There are two methods: (1) by prolonging the line; (2) by reinforcing in intervals ("doubling").

Prolonging the line enables units to remain intact. "Doubling" mixes the units, a serious inconvenience. However, the mixing of the companies of a battalion is not so serious as the mixing of battalions, though *esprit* and training afford bases for the formation of provisional units on the line after the "doubling." Fusion in an extended engagement is unavoidable, but the greatest efficiency is obtained by preserving as long as possible the battalion identity, then the regimental.

By preference prolonging the line is best, other things equal, but constant instruction in "doubling" indicates to the men that the *mélange* is a necessary incident, and need not occasion loss of control; hence will no longer be a disorder.

V. Execution of the Reinforcement.

The French regulations require reinforcements generally to be under the call of the chief of the unit to which assigned, and occasionally they enter on their own initiative, which is the exception.

The commander practically loses control of troops on the firing line, and he himself should not join until the last reinforcements are in, since after joining he can command only a limited part.

Feeding reinforcements by dribblets into the firing line loses the effect of these reinforcements and takes from the chief the initiative of decision as to the proper moment, and this is indicated by conditions on the firing line, and not by arbitrary shoving of reserves forward.

As soon as the supports of the advanced companies have been absorbed the battalion commander must push others forward to take their places.

To reinforce properly there must be a well established means of communication, and simple signals are requisite; the chief of the most advanced support determines the size of the fractions to be sent into the firing line; orders must be explicit; and there must be no hesitation in sending in necessary supports.

Reserves entering the firing line will generally halt for a short time at least, to catch breath, to add to the fire of the line for a short period in order to gain fire superiority, to effect a reorganization by a reapportionment of the line in case of "doubling," to issue ammunition brought up to the firing line, and to receive from the men formerly on the line the necessary firing data.

VI. The Reinforcements at the Moment of Assault.

What decides the moment for the assault? There are two solutions of this problem: if the first line initiates the assault the supports and reserves must follow and add their strength, but at times it will be found necessary to push these latter up to the firing line to give it a forward impetus. Rapidity of movement is absolutely essential.

VII. The Reinforcements in the Decisive Attack.

Under this head follows a discussion which is an elaboration of that in the preceding chapter.

See also

SIEGE OPERATIONS

AUSTERLITZ, Battle of

["Field Service Regulations" and the Battle

of Austerlitz. By Lieut. C. F. Broad, R. F. A. *Journ. of the Royal Artillery.* Jan., 1915. 2800 words, 2 maps.]

Austerlitz furnishes examples of what to do (French) and what not to do (Allies) in the broad principles of information, orders, defense, attack and pursuit.

Timely information of the enemy's dispositions and of the topography of the theater of operations is essential. At the time of Austerlitz, the former was gained by the cavalry, the latter by personal study on the part of commanders. Murat's cavalry ascertained the dispositions of the enemy; the Allied cavalry did not. Savary was sent to the Allied headquarters on a diplomatic mission. There he disseminated false and got correct information. The Ally officer who returned with him was met at the outposts by Napoleon, and got nothing but false impressions. Napoleon studied the battlefield a month before the battle, and again on Dec. 1. Weyrothen had maneuvered over the ground a year before and was satisfied with his knowledge gained then.

The orders of the Allies were issued at 11 p. m. The French were in position by nightfall. Napoleon assembled his marshals at 7 a. m. to assure their knowledge of plans. The Allied orders were vague, and their staff work inferior.

The defensive has its value in economizing troops so as to leave a force available for the offensive. Napoleon kept nearly half his force intact for the counter attack.

The Allies planned an attack to envelope the French right, a plan suitable for a large preponderance of numbers. Their plan failed, due to lack of knowledge of topography and the French dispositions, and to lack of cohesion. Napoleon's counter attack succeeded by striking at the right moment with a large reserve. The Allied plan led to the weak occupation of the center and the retention of a small reserve totally incapable of combating Napoleon's counter attack, which was skilfully concealed and came as a surprise to the Allies. The French attack was well supported by artillery. The Allies exposed their flank and extended their front so that the different parts of the line could not support each other.

The pursuit was a failure; Murat took the wrong direction and lost touch. The Allies were allowed to retire practically unmolested.

The French cavalry was used in reconnaissance. Both the Allied and French cavalry took their places in line with the infantry.

Two rôles are open to cavalry to-day—fire action rendered effective on the flanks by mobility, and the charge. The latter may be used against troops exhausted by the prolonged modern battles.

AUSTRALASIAN OPERATIONS (European War)

See also

AUSTRALIA — EXPEDITIONARY FORCE FOR EUROPEAN WAR

EUROPEAN WAR—OPERATIONS ELSEWHERE—AUSTRALASIAN

AUSTRALIA

See also

EUROPEAN WAR—LOSSES—AUSTRALIA

—Army

See ARMY — ORGANIZATION — SWISS AUSTRALIAN SYSTEM

See also

AUSTRALIA — EXPEDITIONARY FORCE FOR EUROPEAN WAR

—Army—Engineers

See

ENGINEERS—ORGANIZATION—AUSTRALIA

—Army—Organization

[Australian System of Universal Training for Defense. An address by Capt. J. W. Niesigh (Retired, Commonwealth Military Forces) at the Camp of Regular Troops, the Presidio, San Francisco. *Jour. U. S. Cavy. Assn.*, Oct. '15. 3000 words.]

Prior to the Federation of the States of Australia in 1901, and for some time thereafter, the defense scheme was based upon the theory that Australia's isolation was her surest safeguard against aggression. In the belief that Australia could only be attacked after the British navy had been definitely worsted in distant waters, there were provided, for the maintenance of forts and other coastal defenses, only small cadre units of artillery and engineers, while the mobile defense force depended upon voluntary enrollment of citizens into units that were in some cases paid for militia service, and in other instances received no remuneration at all. When there was a prospect of war, the ranks of these units filled rapidly and attendance at drills was regular; but, the excitement having passed, enthusiasm for soldiering went with it. It was not, therefore, uncommon for a considerable percentage of the defense force to exist in official returns only. After federation the forces were brought under one general control and reorganized; but the temporary satisfactory results ceased with the end of the excitement incident to the South African and Russo-Japanese wars. Attendance fell off and difficulty was experienced in recruiting. About 1909 public opinion rapidly developed in favor of compulsory service, which soon afterwards became a part of government policy. A scheme having been drawn up by Australian officers was submitted to Lord Kitchener, then Commander-in-Chief in India. He made an extensive tour of inspection in Australia in 1910, furnishing the Commonwealth Government with a report and recommendations; and the following year the youth of the country were, by appropriate legislation, brought under requirement of general training for the military or naval service. Such service is specifically for home defense, no man being subject to foreign service unless he voluntarily enlists therefor.

The scheme, known as "Lord Kitchener's Scheme," requires: "that every boy when twelve years old shall commence a course of approved physical training in the schools; at fourteen years of age he has to register

AUSTRALIA—Continued

for service and then becomes a 'Senior Cadet,' and is taught elementary drill and the principles of discipline; at eighteen years he passes into the recruit stage of the 'Citizen Forces' where he remains for twelve months learning the more advanced work of the soldier or sailor as the case may be; and at nineteen he becomes a full member of the Citizen Forces—the fighting force in case of need. He remains on the roll then until he is twenty-five years old, after which he is required, in his twenty-sixth year, to attend only a muster parade, and afterwards passes into the reserves."

Training is so arranged as to cause minimum interference with civil pursuits. The attendance required is about sixty-eight hours a year divided up into evening exercises of one hour's duration, afternoon exercises of two hours' duration and what are called "whole-day parades" of about four hours. Further voluntary turn-outs and voluntary attendance at camps supplement the training prescribed. With the citizen army, that is those over eighteen years of age, a portion of the training is continuous and includes ten days in camp for infantry and cavalry and twenty-one days for the special corps. The training above outlined, though apparently brief, has given satisfactory results. It was originally calculated that it would maintain a fighting force of between 80,000 and 90,000, supplemented by an increasing reserve of men who had passed through the ranks and into the reserve at the age of twenty-six. Results have shown the original estimate to be very conservative—this due to increase in population, etc.

The basis of the organization is that each of the six states shall be under the control and direction of a district commandant, who is responsible to the Minister of Defense and the Military Board at the federal headquarters. Each state is divided into brigade areas, and brigade areas into battalion areas, which are in turn sub-divided into training areas. In each of the latter is an area officer, usually an active young lieutenant or captain but occasionally an officer of higher rank. The area officer is assisted by one or two noncommissioned officers of the permanent administrative and instructional staff. The battalion command is exercised in the ordinary way, while the brigade command is held by a permanently employed staff officer.

There was at first opposition of various kinds, passive and active, from pacifists, those to be trained, and parents. Gradually these difficulties have been effectively overcome and the system is not only working thoroughly and effectively, but is very popular. To bring about this condition legal penalties had to be used to some extent; but at present a strong public sentiment makes shirking military duty very unpopular with every one.

The system has been similarly applied to the naval service.

It is of interest that popular demand has brought about the extension of the athletic training of the earlier classes to include training for girls.

—Expeditionary Force for European War

[Australia and the War. Anonymous. *Australian Mil. Jour,* Jan-Mar '15. 9600 words. Photos. Tables.]

Upon the outbreak of war, the resources of Australia were offered to and gratefully accepted by Great Britain. In raising the expeditionary force of 20,000, to be set down at any destination desired by Great Britain and at the expense entirely of Australia, it was found that 10,000 additional volunteers could be immediately sent. The first convoy was formed into a division (staff, three brigades, divisional troops) and one light horse brigade. The second convoy consisted of line of commmunication troops (2000), first reinforcements (3000), two additional light horse brigades (4000), one additional infantry brigade (4500), and certain veterinary units. Further reinforcements are being despatched monthly. These men are all equipped by Australia. Immense numbers of horses were shipped.

This force, together with the New Zealand expeditionary force, left Australia in November, 1914.

Beginning the first day out from Australia, instruction was given to the men and officers in French and German. (A description in detail of the life aboard the transport here follows.)

When three days from Suez, a wireless directed the troops to proceed to Cairo for the defense of Egypt, and to undergo training there. The saving by disembarking in Egypt is immense from both a monetary and physical stand-point. In addition the climate of Egypt was more like that of Australia, there would be at least two hours more of daylight for training, and in case a Turkish army moved against Egypt, there would be as strenuous active service as that in any field in the war.

Cairo was reached Dec 5. The camp site was chosen on the edge of the desert near the Pyramids, used for the army maneuvers in Egypt. The work of preparation was marvelous. Two miles of macadam road on top of a made embankment 10 feet high were finished in 5 days. Reinforced concrete reservoirs were built on both sides of the Nile Valley, and water mains laid. An electric tramway and street lights were quickly established. The Mena House, one of the finest hotels in Egypt, was turned into a military hospital of 300 beds. Shortly after the arrival of the Australian troops, Egypt was proclaimed a British Protectorate.

The training of the force continues from sunrise to sunset, increasing in severity as the time in camp lengthens, due largely to the promise of Lord Kitchener to send these troops to the front as soon as fit. The Australian troops make a very favorable impression. Rigorous discipline is easily maintained through an appeal to the honor and patriotism of the individual men.

[Australia and the War, *Australian Mil. Jour.*, Apr., '15. 9 pages of tables.]

At the end of February Australia had sent out 39,000 troops, as follows:

Inf., 600 officers, 19,000 men; cav., 320 officers, 7000 men; arty., 120 officers, 3400 men; engrs., 21 officers, 600 men; sig. troops, 7 officers, 330 men; medical troops, 200 officers, 2100 men; line of communications, etc., 180 officers, 4900 men. An offer of 10,000 additional troops to be sent in April had been accepted and further reinforcements were contemplated. Cost of Australia's participation in the war, to include June 30th, estimated at $65,000,000.

[The War in Europe. Note. *Army & Navy Jour.*, Nov. 6, '15. 50 words.]

Up to Sept. 29, the Australian Defense Department had sent 63,357 men overseas, and had in addition a like number in training.

See also

DARDANELLES, OPERATIONS AT THE, (1915) —THE GALLIPOLI LANDING—AUSTRALIAN TROOPS

—Expeditionary Force for European War—Instruction and Training

[The Making of the 1st Australian Division. By C. E. W. Bean. *Australian Mil. Jour.*, July, '15. 12,000 words.]

This is a non-technical account of the organization and training of this division in Egypt.

There was little attempt to effect organization in Australia; detachments of all arms and sizes were loaded on transports and moved to Egypt—a six-weeks voyage—in one convoy. Ten or twelve days were required to move the troops to camp, near the Pyramids. In the meantime the organization had been worked out and the various fragments went into camp already allotted to companies, regiments, brigades, etc. The division had its full complement of auxiliaries.

As soon as an organization got its camp established, its training began. Each brigade was given a square of desert extending three or four miles from camp. The first six weeks were devoted to recruit and company drills, including close and extended order, attack formations, entrenching, etc. Then came two weeks of battalion drill, which was followed by brigade drills and maneuvers. In these the entire impedimenta were frequently taken out and the exercises extended over several days, much attention beng devoted to night work.

Brigade maneuvers were followed by division maneuvers, in which the troops were represented by the higher staffs only, communication being kept up by the signal troops. Then came division maneuvers and practice marches, in which all components took part. The last stage, begun about three months after the camp was established, was corps maneuvers, in which this division operated against another.

—Military Conditions in

See also

MOTOR TRANSPORT—IN AUSTRALIA

—Military Policy of

[Australia Sets Us an Example. Address by Capt. J. W. Niesigh, (retired) Commonwealth Military Forces. *Army & Navy Jour.*, Aug 28, '15. 1400 words.]

Australia is a country of great area, enormous wealth, and illimitable resources, with but a relatively small population. It was assumed that isolation and the British navy were sufficient safeguards, and only small cadre units of artillery and engineers for coast defense were maintained by voluntary enlistment. Recent developments have shaken the faith in the sufficiency of this defense. Enthusiasm developed in emergencies, and died away with their passing, and the defensive status was not satisfactory.

In 1901 the forces were brought under one general control, and entirely reorganized. For a time the result was satisfactory, but again after the close of the Russo-Japanese war, the excitement abated and difficulty was experienced in recruiting.

About six years ago, public opinion developed rapidly in favor of compulsory service. There were opponents of this innovation. The "passive resisters" were compelled to serve by public opinion, and the "conscientious objectors" were informed that all service was not on the battle line, and their sons could be used elsewhere.

The rolls were completed and a system of fines compelled a compliance with the law. Discipline was enforced by firmness, tact, and judicious punishments.

Non-attendance at drill was prosecuted in police courts, fines were imposed, and additional drill ordered, generally double the time missed, with increasing severity for repetition of the offense.

The police court process and monetary fines often fell upon parents unable to pay, and the scheme was modified. A special court was instituted, and special penal battalions were established in permanent encampments. Drill shirkers were sent to these penal battalions to perform the duty and any extras added by the magistrate. The effect has been salutary.

The law provides adequate redress against employers who interfere with attendance of employees, and the law has been enforced without hesitation. The cases have, however, been few.

Universal training has enormous social advantages for the community at large. The discipline and physical training must be reflected in the conduct of those receiving it. The initiation of physical training for the twelve-year-old boy in school has led to a popular demand for similar training for girls.

See also

ARMY—ORGANIZATION—SWISS-AUSTRALIAN SYSTEM

AUSTRIA

—Army—Artillery

See

FIELD ARTILLERY

MOUNTAIN ARTILLERY—AUSTRIA

AUSTRIA—Continued
FIELD ARTILLERY—INSTRUCTION AND TRAINING—AUSTRIA
FORTRESS ARTILLERY—FIRING REGULATIONS —AUSTRIA

—History
See also
EUROPEAN WAR

—Military Topography of
See also
EUROPEAN WAR—SOUTHERN THEATER—NOTES ON

AUTOMATIC RIFLE
See INFANTRY—ARMS—RIFLE—AUTOMATIC

AUTOMOBILES
See also
MOTOR TRANSPORT

United States

[New War Cars for Our Army. *Arms and the Man*, Aug. 5, '15. 250 words.]

Col. R. P. Davidson of the Northwestern Military and Naval Academy recently left Chicago for the Pacific Coast with eight military cars, equipped completely for work. They consisted of a reconnaissance car, with a complete outfit of instruments for observation, map making, etc., two wireless cars, one carrying a rapid fire gun and a searchlight in addition to wireless apparatus; field cooking cars, with fireless cookers; hospital cars, with special operating tables; X-ray machine and the latest surgical appliances; a completely armored car; a "quartermaster's car"; and a "balloon destroyer."

Representatives of the War Department accompanied the expedition, to make a report on the equipment.

—Armored

[In the Petrol World. *Sphere,* June 5, '15. 250 words.]

Belgium has taken the initiative in the creation of armored motor car corps. The cars are armored and fitted with cannon or machine guns or both. Other cars, used by officers for observation purposes, carry stores of petrol and spare parts. Motor cyclists, using 2 cylinder light Peugeots and armed with the Belgian service rifle, perform duties of reconnaissance particularly as to the nature of roads over which it is proposed to operate the armored cars, bring assistance to disabled cars from the motor repair shop, and act as connecting links between the commanding officer and the armored motor cars in movement and action.

[A Turtle-Back Armored Car. *Scientific American,* July 17, '15. 150 words.]

A resident of Lowell, Mass., has designed an armored car shaped exactly like a turtle, the upper and lower shells being joined about sixteen inches above the ground, and the whole being completely covered by the armor. Loopholes are provided for firing and a periscope for steering. A quick-firing gun is mounted on a revolving base.

[Test of Armored Motor Car. Report of Lieut. W. G. Renwick, Battalion Q.M., N. G. Mass. *Army & Navy Jour.,* Aug. 21, '15. 1800 words.]

Armored motor cars may be divided into two classes—the light and fast, and the heavy and powerful. The first results from placing a loopholed steel box on the chassis of a touring car; the second from a similar but heavier addition to the chassis of a truck.

The experiments were with the light and fast type. It participated in two problems, and as a result of observation, it showed itself effective in rear guard actions, on outpost work, for engineer demolitions, raids in rear of the enemy, and emergency support.

But the armored car has decided weaknesses. On narrow roads it is difficult to turn around. Ditches across the road, felled trees, burning gasoline, and many other easily contrived obstructions will stop an armored car and cause its capture. Its value is as an extremely mobile unit capable when necessary of fire action of considerable weight. Every regiment, or at least every brigade, should be supplied with one.

AVIATION
See
AERONAUTICS

BALKAN WARS

[The Turko-Balkan War—By Guillermo Chaparro. *Mem. del Ejército* (Chile), July, '15. Continued from previous issue. 3000 words. (To be continued).]

The detachment commanded by Gen. Theodorof crossed the frontier at Barakli October 18th and advanced in two columns by the valley of the Struma on Salonica, where it embarked for Dedeagatch to combine with the Bulgarian forces operating in Thrace.

Gen. Kovatcheff crossed the frontier also on the 18th near Philippopoli and Haskeni and attacked the Turks at Kirdjali and Pechmali. The Turks, commanded by Yaver Pacha, were greatly outnumbered and forced to retire to the south. Kovatcheff followed in three columns and Gaver Pacha was forced back slowly to Feredjik where, finding himself threatened on all sides by greatly superior forces and without ammunition or food, he was compelled to capitulate on November 27th.

Operations in Thrace.

Three Bulgarian armies advanced simultaneously to the frontier on Oct 18th, the II and III toward Adrianople and Kirkkilisse; the I following in the center covered the interval between the other two.

Adrianople, situated at the confluence of the Maritza and Tundja, is encircled by a number of small works of little value, constructed during the Turko-Russian War. In 1903, strong defensive works of modern type were erected on all fronts at 10 km. from the city. The garrison consisted of 50,000 men under the command of Choukri Pacha. The Bulgarians attempted to carry the place by assault, but after tremendous efforts continued for three days without result, were compelled to desist.

Regular siege operations were initiated Oct.

21st, and the circle was completed and the city isolated Nov. 15th. Up to Dec. 3rd, when the armistice became effective, the struggle continued with increasing violence, the allies having made twenty distinct attacks and the garrison ten sorties. Hostilities were resumed on January 30th with no material gains for the allies, but famine and pestilence increased daily within the city and, there being no hope of relief, Choukri Pacha capitulated March 26th. The III Army arrived before Kirk-kilisse Oct. 20th. The city lies in a flat plain surrounded by vineyards. The permanent defensive works were without guns, and the garrison, consisting of the I and III corps, was deficient in necessary supplies and ammunition. The Bulgarians attacked on the 22nd and gained ground on the 23rd. A counter attack during the night 23-24 was at first successful but, coming unexpectedly under a disastrous fire from intrenched positions, the Turks were seized with panic which extended to the troops in rear and the rout continued until they reached the shelter of the forest of Spudjok. An investigation of the panic resulted in the execution of 200 officers and soldiers believed to have been responsible.

After Kirk-Kilisse, the Turks fell back toward Viza and Lule Burgas covering the main approaches to Constantinople. On Oct. 29th the Turkish forces under Abdullah Pacha were concentrated on the heights along the left bank of the Karagatchderesi from Viza on the right to a point 6 km. south of Lule Burgas, in which positions they were confronted by the I and III Bulgarian Armies. The Turks had only 200 rounds per rifle and artillery ammunition for one day's battle. It is also reported that mounted messengers were the only means of rapid communication available to the headquarters.

See also
ADRIANOPLE, SIEGE OF
EUROPEAN WAR—SOUTHEASTERN THEATER

—Artillery in

See
ARTILLERY—USE OF IN BALKAN WAR

—Cavalry in

See
CAVALRY—USE OF IN BALKAN WARS

—Military lessons of

[The Turco-Balkan War and Its Lessons. By Capt. Arturo Maillard. *Memorial del Estado Mayor del Ejército de Chile,* Jan 1, '15. and Mar 1, '15. (To be continued.) 6000 words.]

Both the Russo-Japanese war and the Turco-Balkan war caused changes in tactics, and the latter was especially valuable to countries like Chile, having about the same strength and encountering the same difficulties in passing from a peace to a war footing.

The strategic deployment is shown by sketch maps and tables. The theater of operations is divided into four sectors—the east, the center, the west, and the southwest.

The Allies, from east to west and around the southwest were deployed in the order of countries, Bulgarians, Serbians, Montenegrins, and Greeks. Beginning with the left wing of the Bulgarian army, the forces deployed at the outset were: *Bulgarian,* 3d Army, 53,000 men and 183 guns, directed on Kirk-Kilisse; 1st Army, 63,000 men and 190 guns, directed on the Turkish forces between Kirk-Kilisse and Adrianople; the 2d Army, 65,000 men and 266 guns, directed on Adrianople; and to cover the right wing and connect with the Serbians, one division and two separate brigades, a grand total of 230,000 men and 750 guns, not including territorial troops; *Serbian,* 2d Army, of one division, 14,000 men and 36 guns, connecting with the Bulgarians, directed on Seras, on the Struma River; 1st Army, 5½ divisions of infantry and one of cavalry, 79,500 men and 232 guns, directed on Uskub; 3d Army, 3 divisions, 34,000 men and 120 guns, directed on Pristina and later on Uskub in union with the 1st Army; and the Division of Ibar, 16,000 men and 56 guns, to occupy Novi-Bazar and connect with the Montenegrins, a grand total of 139,000 men and 408 guns; *Montenegrin,* in three groups, directed on Scutari, to form a junction first with the Serbians and later with the Greeks, a total of 30,000 men; *Greek,* having for a primary objective Salonica, divided into two principal groups and reserves, the Arta group of 10,000 men and 16 guns, directed on Janina, and the principal army of 45,800 men and 140 guns, directed from the outset on Salonica.

The Turks, to oppose this deployment, had the Army of the East, of 72,000 men and 288 guns, operating towards Kirk-Kilisse, with a garrison of 40,000 men in Adrianople; and the Army of the West, divided into two forces, one opposing the Servians and Montenegrins, of 142,000 men and 264 guns, and one opposing the Greeks and operating in Albania, of 51,000 men and 108 guns, a grand total of 285,000 men and 372 guns. But of this total only 170,000 men constituted the mobile army and the remainder was garrisoning Adrianople, Scutari, Janina, Salonica, and some minor posts.

The difficult country on the frontier of Bulgaria and the passive attitude of the Turks allowed the Bulgarians the initiative, and the latter began operations with the Turkish army as the primary objective, and Adrianople secondary, first moving on the Turkish right wing near Kirk-Kilisse and endeavoring to envelop it. The Turks did not anticipate attack from this direction, relying on the difficulties of the terrain to protect them.

The command of the Turkish Army of the East by Abdullah Pachá was interfered with by the minister of war, Nasim Pachá, to the confusion of the operations, and in contrast the Bulgarian command was held directly by Czar Ferdinand and consequently the initial advantage lay with the Bulgarians. The Turks did not try to fight a decisive battle at Kirk-Kilisse, and on the other hand, neither did the Bulgarians pursue their advantage.

The Serbian operations in Macedonia began Oct 1 under the direct command of the king, the total force soon being increased to over 200,000 men, divided into four armies, the first three directed on the Turkish detachments about Uskub and Monastir and the fourth assigned to clear Novi-Bazar.

BALKAN WARS—Continued

The Turks tried to interfere with the Serbian mobilization even before the declaration of war, throwing some detachments across the frontier towards Vranja, but these troops were defeated owing to lack of supply, support, and organization.

On Oct 18 war was declared, and the Serbian 1st, 2d and 3d Armies moved simultaneously. The 3d Army defeated the Turks at Pristina and marched on Uskub. The 2d and 1st Armies moved on Kumanovo. To oppose these latter the Turks had two corps and two separate divisions of the Army of the West. A furious battle was fought at Kumanovo, in which the Serbians were successful, losing over 3000 killed, amongst whom many were officers, while the Turkish loss, though not exactly known, was estimated to exceed 10,000 killed and wounded. The Serbians captured 80 guns, 300 vehicles of all classes, and a large quantity of supplies. The loss of Kumanovo by the Turks caused a further retirement towards Monastir of their forces that had been thrown back from Pristina by the 3d Army. The Serbians pursued vigorously, to the great disorder of the Turks.

At the same time the Greeks interrupted the communication by sea towards Salonica, and the net result of the first operations was to isolate the Turkish Army of the West.

Zekki Pachá, commanding this army, then sought bases of supplies in Albania, and concentrated at Monastir, notwithstanding the fact that the Greeks were preparing to invest Salonica.

The Serbian advance on Uskub and Monastir necessitated readjustments between the cooperating armies, and the state of the weather required tremendous efforts from the troops.

At Prilep the Turks made a stubborn stand and in dislodging them the Serbians lost 3000 men and the Turks 7000 killed, wounded, and prisoners. But the delay enabled the Turks to form at Monastir, behind strong field works, on a terrain of great defensive strength. The Serbians were compelled to deploy in the open under fire of the Turkish batteries.

The battle lasted four days and three nights, in the midst of mud, fog, and swamps. For more than a kilometer, on one part of the front, the Serbians advanced with water to their shoulders, holding their rifles and ammunition over their heads, under fire of the enemy, while their own artillery played over their heads. On reaching firm ground they deployed as if at maneuvers. The Turks were decisively defeated, losing 10,000 dead and wounded and all their artillery, in addition to 10,000 prisoners, amongst whom were eight generals. The Serbian loss was 8000. This was the greatest battle of the west.

[The Turco-Balkan War and its Lessons. By Capt. Arturo Maillard. *Memorial del Estado Mayor de Chile*, Apr, '15. Continuation from previous number. 4500 words.]

A short review is given of the events recorded in the previous number. Unfortunately, there was no co-operation between the Serbians and the Greeks, the latter placing more importance on the capture of Salonica, as this objective offered great possibilities for the future development of Greece. This lack of co-operation saved the Turks from complete annihilation.

The Greeks crossed their frontier also on the 18th of October,—under the direct command of Crown Prince Constantine,—organized in seven divisions of infantry and one of cavalry, about 60,000 men. Another division joined later. A battle was fought on the 1st and 2d of November with 19,000 Turks fortified at Tenidze, half way to Salonica, and the Turks were defeated.

On Nov 8th the advance guard of the Greek army arrived before Salonica, and began an immediate attack. The city was weakly defended on the land side, and was compelled to surrender on the 9th.

The Turks held Novi-Bazar and Durazzo with only 3000 men, and by the end of October the Montenegrins and Serbians were in complete possession.

Montenegro's immediate objective was Scutari, since that was the direction the small kingdom must expand, but due to the weakness of her military offensive preparations, and to the strength and preparation of Scutari for defense, the place was not captured until Apr 23, 1913.

Adrianople was besieged by 28,000 Serbians and 67,000 Bulgarians, with 138 heavy guns. The Turkish strength is not stated, but the works were strong and the city and fortifications when captured were provisioned for two months. The final attack began Mar 23d, and by the afternoon of the 25th the place was in possession of the Allies, after desperate fighting. One thousand officers, 38,000 soldiers, 600 guns, and large quantities of munitions and provisions were secured.

The Turks having been forced towards Constantinople took up a position at Tschataldja. The principal line of works consisted of three old forts, one near the Sea of Marmora, one near the Gulf of Saros, and the third half-way between. These works were so strengthened as to stop the allied advance. The state of the weather also operated to the disadvantage of the attacking troops, and in the middle of February the 1st Bulgarian Army retired, leaving only two divisions holding the advanced positions in front of the works, where they remained until the conclusion of hostilities.

On the 4th of December, 1912, an armistice was signed for the general suspension of all hostilities. All the troops were to remain in their positions and the besieged places (Adrianople, Scutari, and Janina) were not to receive provisions. This armistice lasted until Feb 3, 1913, and resulted with benefit to the Turks on the Tschataldja lines, where the works were strengthened, and reinforcements brought in from Asia Minor.

A force of about 45,000 Greeks was directed on Janina at the outbreak of the war. The artillery contingent with this army was provided with 120 guns, of which 20 were obsolete.

Janina had very old fortifications, reinforced by new battery positions and infantry trenches. The final attack began on Mar 4th, and the city surrendered Mar 8th.

The Turks owe their defeat to lack of training; to Asiatic troops not being acclimated; to lack of supplies; and to inefficient leadership.

[The Turco-Balkan War and Its Lessons. By Capt. Arturo Maillard. *Memorial del Estado Mayor de Chile,* May, '15. Cont. 3000 words. To be cont.]

Part of the 4th Servian Army had for its mission the clearing of the Sandjak of Novi-Bazar. This was accomplished by the capture of the fortress of Novi-Bazar on the 24th of October. It had been defended by 7000 Turks, one-half of the force being irregulars. By the end of October several smaller places had been captured and the region cleared.

Operations of the Montenegrin Army

The mobilization of the Montenegrin militia commenced Oct. 1st and on the 8th war was declared. Four divisions were organized, with a total strength of 37,000 men. There was no cavalry nor sanitary troops, and scarcely any transportation.

The garrison of Scutari consisted of 15,000 men under Harran Riza Pashá. The defenses were field works, some very well placed and armed, and one fort of considerable strength.

The character of the terrain was such as to favor ambuscades and operations of irregular forces.

A few small garrisons of Turks were in Novi-Bazar, and these were cleared with the aid of the Servians, and the main operations of the Montenegrins were directed around Lake Scutari. Several small places on the north side of the lake were captured with considerable loss to the assailants. The main fortification of Scutari, Fort Tarabosch, was assaulted on the night of October 10th and the Montenegrins were defeated with heavy loss. This showed that a siege was necessary, and the king determined upon the slow processes of trench work to avoid disaster to his little army. The siege artillery that the Montenegrins could muster consisted of only 18 guns and a few rapid firers. The circumference of the works surrounding the city was too great for the besiegers, and the Turks made frequent sallies. Due to the superiority of the Turkish artillery, the situation of the Montenegrins daily became more difficult, and the armistice arranged by all the belligerents early in December was hailed with secret joy by the Montenegrin leaders. But they did not count on Hassan Pashá rejecting the armistice, which he did when the king sent a communication to him. On Dec 10th and 11th the Turkish Infantry renewed the attacks from the forts and assaulted the besiegers' trenches.

On Dec. 18th the Turks made a sally to the south and attacked the Servians, who had moved toward Médua, and it was only at great cost that the Turks were repulsed. Another sally was made on the 25th to the north, against the Montenegrins, one besieging division being placed completely on the defensive; and again on the 10th and 11th of February the Turks took the offensive.

The result of these operations was to place the Turks in the advantage, when suddenly and mysteriously the place surrendered.

Bulgarian and Turkish Operations in Macedonia and Thrace

(A resumé of previous descriptions, giving more complete details concerning commanders.)

—Turko-Serbian operations

[Serbia and Turkey. By Capt. H. W. Young, 116th Mahrattas. *Jour. of the United Service Inst. of India.* Jan, 1915. 8500 words, 2 sketch maps.]

The Turks are not, and never have been, a nation. They are an army of occupation. A ruling caste that has no genius for administration must at least possess high military efficiency. This the Turks did possess at one time, but it dwindled gradually to nothing.

Turkey in Europe, in 1912, was composed of Macedonia, Thrace, and Epirus, which contained a heterogeneous population. The Turks carefully fostered this confusion of nationalities to prevent their joining Serbia, Bulgaria or Greece. The success of this policy is at the root of the Balkan disturbances.

The object of the first Balkan war was to drive the Turks out of Europe and to divide their territory. The principal object of the Serbians was the attainment of a strategical frontier that they could successfully defend against the Turks. This was a moving factor in the war with Turkey, and also one of the principal causes of the subsequent war with Bulgaria.

When it became clear that the Allies would drive the Turks out of all their possessions but Constantinople, the Serbians began to hope to get an outlet to the sea. When they were sent back from the Adriatic, they blamed Austria.

The Turkish plan was to concentrate at Uskub and to move against Sofia so as to draw the Bulgarian army away from Thrace. The advancing force, divided into two columns separated by nearly 300 miles of very difficult country and connected by a single railway line only, was to operate on exterior lines against the enemy's capital. Even had there been no other enemy, this would have been a most difficult operation. As it was, the Serbians completely upset this plan.

The Serbians expected the Turks to stand on the defensive on the Plateau of Ovje Polye, east of Uskub, the strategic key to the Balkan peninsula. Hampered by an untenable frontier guarded by Turkish blockhouses and having to clear the Sanjak before they could advance safely, the Serbians had to disperse their force from the very start. One army was sent to co-operate with the Bulgarians. Two armies, connected by an independent brigade and covered by a cavalry division, were concentrated between Goliak and Pilatovitza and moved south on Uskub, one via Kumanovo, the other along the railway. A fourth army cleared the Sanjak and an independent brigade watched Austria on the Bosnian frontier.

The First Army was to march through

BALKAN WARS—Continued

Kumanovo on Uskub, covered by the cavalry division. In this movement, the center and right divisions were delayed and the left division (the Danube Division) arrived unsupported at Kumanovo twelve hours ahead of the other two.

When the cavalry division ran into the advance troops of the Turks, it was unable to give timely warning to the isolated Danube Division that followed close at its heels, but had to resort to dismounted action to save the advance troops of that division from annihilation. If the Turkish cavalry had revealed the isolation of the Danube Division, the Serbian 1st army might have been defeated in detail. But the Turkish cavalry did nothing, and the Turkish generals were obsessed with the idea of advancing on Sofia and did not credit a Serbian advance. They accordingly made isolated attacks and the Danube Division was able to hold its own with the assistance of the cavalry division for more than twelve hours. Next morning, when the rest of the Serbian army came up, the Turks were thrown on the defensive and by 3 p.m. were in full retreat.

There was practically no pursuit after the battle of Kumanovo, because the cavalry was exhausted, the country was unsuitable for cavalry operations, and the Serbians did not want to risk the only mounted troops they possessed. The last is probably the true reason, but had they taken some risk, the Serbians would have saved themselves much future loss.

Kumanovo was a typical rencontre. There was not time to construct anything but hasty intrenchments. The forces met without warning, the cavalry on both sides failing to collect useful information. But the battle is important because it completely broke up the Turkish strategy and freed the Bulgarians of any apprehension in regard to the Turkish army of Macedonia.

The campaign in the Sanjak and in Northern Albania are good examples of regular troops operating against wild, half-disciplined mountaineers in their native hills. The 3rd Serbian army crossed the frontier after fighting for five or six days against a mixed force of Turkish regulars and irregulars. When it arrived at Uskub, it found that place already in the hands of the victors of Kumanovo. After Kumanovo, the Turks retreated by Uskub on Monastir. The Serbians were more than a week in following up their success. The Turks made no attempt at resistance until they reached Prisatz, where they were quickly outflanked and had to retire. The Serbians now wasted another week, the Turks, meanwhile, taking up a position at Prilep. The Servians attacked this position in front and sent a large force around its left, which forced the Turks to retire to Monastir. Exhausted by losses and exposure, the Serbians rested for six days at Prilep, thus giving the Turks time to strengthen their position at Monastir.

Djavid Pasha, the ablest of the Turkish generals, took command of the Monastir position, which was very nearly ideal. The Serbians attacked this position all along the line at 6 a.m., November 16th, the fight lasting until dawn on the 18th, when the position became untenable through the capture of the hill of Oblakova, the key of the position. Djavid Pasha himself defended this hill to the very last with some 2,000 men and finally covered the Turkish retreat, managing to slip away just before dawn.

History will do justice to the Serbians for their share in the operations, but one who studies this war closely will have most admiration for the heroic resistance of the badly organized, half-starved remnant of the Turkish army, which showed that, in spite of all handicaps, it could fight to the last.

—Use of artillery in

See
ARTILLERY—USE OF IN BALKAN WARS

—Work of Sanitary Service in

[General Medico-Military Observations in the Late Balkan Wars. By Maj. C. S. Ford, Med. Corps, U. S. Army. *Military Surgeon*, Jan, 1915. 6500 words.]

The conclusions to be drawn from the present European War will overshadow in importance those from minor precedents, but they are not yet available.

THE FIRST WAR

The Balkan War occupied two theatres, the principal in Thrace where the Bulgarians and the Turkish Army of the East fought, and the other in Macedonia where the Turkish Army of the West fought against the Serbians and Greeks.

The Thracian campaign comprised two stages, the first (Oct 16-31) resulting in the complete rout of the Turkish army, and the second comprising the siege of Adrianople and the operations on the Chatalja lines.

A severe cholera epidemic occasioning possibly 10,000 deaths broke out in the Turkish army at Chatalja. The Turkish government was prevented from taking proper care of the sick by stress of circumstances. Rough but substantial sanitary measures were carried out.

No definite data can be given as to the percentage of wounded by shrapnel and rifle fire. The author's own limited experience gave 35% of shrapnel wounds, which is probably larger than the general average.

The Red Cross found difficulty in establishing itself because its organization did not fit the military units. Professional services without equipment and organization could not and would not have been utilized.

In the Turkish army there was a chief surgeon with each corps and each division, and a surgeon with each battalion. Regulations called for a sanitary company of 100 men and four field hospitals to each division. The actual personnel and equipment was about half of this. The sanitary equipment at Chatalja was largely improvised, the regular equipment having mostly been lost on the retreat. There were two base hospitals. Water supply was examined and placarded. The sanitary conditions at Chatalja were as good as they would have been in an American army under like military conditions.

THE SECOND WAR

In the Second Balkan War (July, 1913) the operations were in two adjacent theatres in Macedonia, between the Bulgars on one side and the Greeks and Serbians on the other.

It took two weeks after the close of hostilities to clear the field hospitals and rest stations. In the Kustendil Hospital, about 10,000 cases were admitted. The volume of surgical work was so great as to forbid careful scientific attention. For a number of days the surgeons were so occupied with new cases as to practically prevent attention to the wards. Formal operations under anæsthetic were few, and the proportion of major operations was surprisingly low. The great majority of patients traveled four days in bull carts to reach the hospital.

In this war, the proportion of rifle wounds was about 75%. There was no indication of the general use of dum-dum bullets.

The Bulgarian Medical Service is not perfect, because the War Department considered guns and battalions more necessary than an adequate medical service. The administration of the sanitary department was poor.

BALLISTICS

See also

ARTILLERY—FIRE
COAST ARTILLERY—BALLISTICS
FIELD ARTILLERY—BALLISTICS
INFANTRY—FIRE—BALLISTICS
TRAJECTORY

—Effect of Rotation of the Earth

[The Influence of the Earth's Rotation upon the Flight of Projectiles. By Ernst Wildhaber, *Schweizerische Zeitschrift.* Apr. '15. 1100 words. 8 Figs.]

A mathematical treatise on the subject of the effect of the rotation of the earth on the trajectory of a projectile. After an elaborate development of equations, certain working formulas are obtained.

Taking a concrete case, it appears that in the case of a howitzer fired north-south for a range of 8000 yards and 40 sec. time of flight, the deflection of the projectile due to the rotation of the earth is 16 yds. or 2 mils.

—Effect of Wind

[The Effect of a Cross Wind on a Projectile in Flight. By 2nd Lieut. H. Gillman, R.G.A. *Jour. Royal Artillery.* July, '15. 600 words. 1 table.]

The formula, given in Text Book of Gunnery Part I, 1914, for the errors in direction of projectiles caused by a wind force blowing at right angles to the line of fire, is based upon the assumption that such errors for a wind force of given intensity are proportional to the initial velocity.

The formula is $D = W(T - \frac{3R}{V})$.

Let us assume:

D=Lateral drift due to wind.

W=Component force of the wind normal to the line of fire.

T or (t)=Time of flight in seconds.

R=Range in yards.

V=Muzzle velocity in f. s.

v=Remaining velocity in f. s.

A uniform wind velocity of W f. s. is a constant pressure acting laterally on the projectile during its flight, and we cannot compare it proportionally to the velocity of propulsion of the projectile which is not a uniform velocity along the range. We should compare it rather to the mean velocity during flight, which for all practical purposes, may be taken as the mean of the muzzle and remaining velocities or $\frac{V+v}{2}$.

The formula then becomes

$$D = (Vt - 3R)\frac{2W}{V+v}$$

It is found that at short range the two formulas give practically the same results, but at long ranges the lateral drift, as a result of using the mean velocity, is sensibly greater.

—Secondary Ballistic Functions

[Secondary Ballistic Functions. *Arms & Explosives,* Mar and Apr., 1915. 1800 words. Also table of secondary functions.]

(This article, mathematical in its nature, is not susceptible of abstraction. Its purpose is to show the value of tables for getting out secondary ballistic functions by a more direct route than the principal tables in common (British) use; a table of b to four places of decimals is furnished for $Sin\ 2\omega = Cb$, in which =angle of descent.)

BALLOONS

See also

DIRIGIBLES
HYDROGEN—PRODUCTION OF—FOR BALLOONS
KITE BALLOONS

—Captive

[Military Observation from Captive Balloons. *Mem. de Artill.* (Spain) April, 1915. 700 words.]

Pear-shaped balloons for the above purpose formed no part of the equipment of the French army on the outbreak of hostilities. Since the beginning of the war models of this type have been constructed in place of the standard spherical balloons with noted increase of stability, of economy of gas, and of ease of handling.

Captive balloons have been used principally for the service of heavy field batteries of the larger caliber and for the ships in the bombardments of the German troops and positions on the Belgium coast.

—Dirigible

See

DIRIGIBLES

BANDS, Military

United States

[Military School of Music. By Major F. A. Mahan, U. S. Army Retired. *Infantry Jour.,* July-Aug, '15. 3000 words.]

With two exceptions, the members of army bands are paid, grade for grade, far more than any other men in the Army, yet no part of the service is so badly performed. Army

BANDS, Military—Continued

bands cost about $1,500,000 yearly, for which the country and the Army receive little return.

This condition is due to lack of musical knowledge on the part of those who decide upon the requirements of bandmasters; lack of musical education on the part of these bandmasters; and to the impossibility of obtaining good musicians under existing conditions.

A special school for the training of army musicians is needed. There are some 215,000 musicians in United States who spend a great part of their time at manual labor of some kind, and with the possibility of securing a good musical education many would enter the service. Many might leave, but do not all our trained men sooner or later leave? And is not the country the gainer? By adding 10% to the amount now expended foolishly, we could obtain 100 men yearly, well trained as musicians and soldiers, and greatly improve our Army Bands.

BARBED WIRE ENTANGLEMENTS

[Barbed Wire in the Great War. *Sphere*, July 3, '15. 800 words. Illustrated.]

(Note: The ordinary low and high wire entanglements are described. The only novel features are the sloping cut of the top of the posts in the high wire entanglement to prevent the use of boards in crossing; the use of broken bottles and odd pieces of tangled wire in connection with the entanglements; and alarm signals, trip wires and electric signals.)

—Destruction of

[Barbed Wire Entanglements. Editorial. *Artill. Monatshefte*. Feb 15].

An invention for their destruction consists of a hook with line attached which is fired from a trench by a rocket. The hook is then drawn back by means of the line.

—Destruction of—By High Explosives

[Destruction of Wire Entanglements by Means of High Explosives. Current notes on the European War. Editorial. *Artill. Monatshefte*, Apr. '15. 1600 words.]

[Destruction of Wire Entanglements by Means of High Explosives. *Arms and the Man*, Oct 7, '15.]

In *France* rigid or flexible cartridges of melinite are used. The charges are built up by sections to the desired length, each section being composed of three groups of cartridges assembled on a stick 4 cm. thick, 6.5 cm. wide, and 5 m. long. On the front end of the stick is a conical wooden head upon which are mounted an iron cap and a pair of small wooden wheels to facilitate the insertion of the charge in the obstacle. Each stick will carry 99 cartridges or 2.65 kg. melinite per meter of length, producing a breached passage 4 m. wide.

In *Russia*, rigid cartridges attached to sticks about 3 m. long were first used, but sometimes failed to demolish. They have now copied the French model by using built up charges, each section composed of a stick 2.5 to 4 cm. thick, 7.5 cm. wide and 1.8 m. long, carrying pyroxylin cartridges. Sticks are joined together by a latch, the first stick having a head facilitating insertion. 3.5 kg. pyroxylin per meter are used. For an obstacle 6.5 m. wide, three sticks are required; for one 8.5 m. wide, four sticks are necessary. Experiments have given satisfactory results, but changes have been recommended.

In *England*, dynamite torpedoes containing 16.3 kg. of explosives, were used against wire entanglements, 5.3 m. long and 7.3 m. wide. These torpedoes consist of a soft lead tube 7 m. long, 6 cm. in diameter, filled with dynamite. The torpedoes were placed half way from the ground, and produced a breach 6 m. wide. Flexible sticks 8 m. long made up of 250 conical explosive cartridges of gun cotton weighing 28 g. and strung on a stout cord were also used. These made a breach 1.8 m. wide.

In *India*, soft lead torpedoes 2 m. long and 6 cm. in diameter were used. These torpedoes have a coupling sleeve by which they can be assembled in charges of any desired length. Each torpedo is filled with 23 packets, each containing 4 explosive cartridges giving a charge weighing 2.5 kg. for each meter of length. These torpedoes are equipped with a point on one end to facilitate insertion and a wooden grip handle on the other for easy manipulation and safety in transportation. In all the above charges a fuse and detonating cap are used to detonate the charge. The attackers can take position without danger about 100 m. from the point of explosion.

—Use of in European War

[The Dardanelles Campaign. Barbed Wire on the Gallipoli Peninsula. *Sphere*, Aug. 7, '15. 600 words.]

The Allies have experienced difficulty in dealing with the Turkish barbed wire entanglements. These are used freely; the wire is heavier, with longer barbs than has been previously used. One correspondent states that armored cars have been used successfully in breaking these entanglements. Hooks are thrown into the entanglement and the cars back out.

BATH TRAINS

Russia

[Bath Trains of the Russian Army. *Scientific American*, July 3, '15. 700 words. Illus. diag.]

On account of the great bathing proclivities of the Russian people, the government has built for the army three bath trains, called "Banjas."

Each train is made up of about twenty cars—reconstructed passenger coaches of the third and fourth classes, and freight cars. They are paneled with warm material, and joined by warm vestibules, so that men can pass freely from the undressing car to the bath and on to the dressing car. The train is lighted by electricity and heated, when necessary, by steam, and hot water is supplied from the locomotive boiler. In the train are tank cars carrying a twenty-four hours' supply of water. To fill these cars there is

an electric pump that will draw the water about 700 feet.

Each undressing car has longitudinal seats, numbered, to accommodate forty-eight men. On entering the car each man receives a number check corresponding to the seat assigned him. Under the seat he finds a bag for his outer clothing and one for his soiled linen, each with the seat number. Hair cutting is done in this car. From here the soldier passes to the bathing car, which contains twenty-four partitioned compartments and a steam bath. The compartments are fitted with hot and cold water.

While the men are bathing, their dirty linen is taken by attendants, disinfected with steam formalin, and sent to the soiled linen store or returned to the man in the dressing car. To disinfect the clothing it is subjected to 100 degrees centigrade for ten or fifteen minutes.

In the dressing car the man finds on his numbered seat a bag with clean linen and disinfected clothing; and when dressed he passes to the "tea room," in the next car, where he is served with tea, sugar, tobacco, &c.

At present the three bath trains in the Russian army each has a capacity of two to three thousand soldiers per day at a total cost of 10,000 rubles ($7,700) per month, not counting the linen.

BATTLESHIPS

—Comparative Power of

[Which is the Most Powerful Battleship? *Scientific American,* July 24, '15. 2500 words. Illus. Tables.]

The United States *California* class, the *Tourville* of France, the *Fuso* of Japan, and the *Queen Elizabeth* of England are compared.

In the tables 100 points are assigned to a theoretically perfect ship, distributed as follows: to gunfire, 40; to armor, 30; to speed, 20, and to displacement, 10; and as a result of the combination of the tables it is found that the resulting order of efficiency is: 1st, *Queen Elizabeth,* 94.73 points; 2d. *Tourville,* 90.06 points; 3d, *California,* 88.53 points, and 4th, *Fuso,* 83.57 points.

BAYONET

[At the Point of the Bayonet. By T. S. Barrows. *Arms and the Man.* Nov. 4, '15. 2000 words.]

With the invention of the magazine rifle using smokeless powder, the bayonet fell into disuse, until recalled, so to say, in the Russo-Japanese war. The French however have always liked it, as have the British and Russians. Not so the Germans: they have in late years given it a very secondary position as an effective weapon. The French bayonet is 1.7 feet long; the British, 1.4; the Russian, 1.4; the Turkish, 1.5; the Austrian, 0.8; the Italian, 1.0; the German, 1.7. This weapon has been much used in the present war.

[The various origins given of this weapon are stated and some notion of its history, and of the various early as well as of actual types. The first battle to be won by a bayonet charge was that of Neerwinden, July, 1693. Vauban introduced the socketed bayonet into the French army; it remained the classic type until the high front sight of the rifle compelled the adoption of a pattern attached by a lug under the barrel.]

BELCHER ELEVATING DEVICE (For Coast Artillery)

[The Belcher Slow-Motion Elevating Device for 12-Inch Barbette Guns. By 2d Lieut. William C. Harrison, Coast Artillery Corps, U. S. A. *Jour. U. S. Artill.,* Jan.-Feb., '15. 1000 words.]

One of the difficulties in the operation of the present type of U. S. barbette carriage has been the loss of time in setting accurately the elevation. This is largely due to the fact that the man at the elevating hand-wheel cannot see the range disk.

The Belcher slow-motion elevating device was designed by Sgt. B. C. Belcher, 26th Co., C. A. C., to correct this defect, by providing a device for attachment to the elevating shaft with a handle convenient to the position of the range setter at the range disk. The range is set approximately by the man at the elevating hand-wheel, and is then set accurately by the elevation setter operating the slow-motion device.

(For a full description of the device, reference should be had to the complete article.)

BELGIUM

—Fortifications

[Permanent Fortifications. The War in Europe. *Army & Navy Jour.* May 8, 1915.]

The defenses of Antwerp, Liége, and Namur have been strengthened by the Germans. Antwerp is supposed to be stronger than Metz, and Liége can offer a very strong resistance if ever attacked.

BILHARZIOSIS

[Report on the Results of the Bilharzia Mission in Egypt, 1915. By R. T. Leiper, Helminthologist London School Tropical Medicine. *Jour. Royal Army Medical Corps.* July, '15. 2000 words. Illustrated. Bibliography. To be continued.]

Gives life history, etc., of this trematode; shows how the infection occurs in drinking and particularly in bathing in infected water; gives the result of experimental infections; shows that troops can only infect other troops through the intermediary mollusc; and puts a doubt upon the conclusions of Loose.

BLAST FURNACE

[The Blast Furnace. By F. Bona. *Mem. de Artill.* (Spain), June, '15. 10,000 words, 7 figures.]

(This is a well written article intended for laymen, but contains little or nothing that cannot be found in any standard work on blast furnace practice.)

BLERIOT AEROPLANE

—Two-Seater Tractor

[The 160-H.P. Armored Blériot Two-seater. *Flight,* Feb. 26, '15. 400 words. Illustrations.]

BLERIOT AEROPLANE—Continued

This machine of the tractor type closely follows standard Blériot practice. Lateral control is secured by the warp of the wings. The body is of ample depth, allowing the gunner to work either standing or sitting. The casing of 3mm. chrome steel extends from the front of the body to the rear of the gunner's seat and completely incloses the engine, a 160-H.P. Gnome, the gunner, pilot, tanks and controls. Suitable openings in the body allow fire downward. In tests this machine was required to develop 130 kilometers an hour in straight flight, to climb 1000 meters in 10 minutes, and to land in a field 100 meters long. These tests, loaded to 375 pounds, it easily accomplished.

BLUE CROSS SOCIETY

[British Blue Cross Society. 1st Lt. J. G. Quekemeyer, 13th Cav. *Jour. U. S. Cav. Assn.* Apr '15. 1500 words. Illustrated.]

[A detailed description of measures taken by the above society with a view to the relief and amelioration of suffering of horses in war time, with especial reference to work in France during the present war.]

BOMBS

See also
GRENADES

—Aerial

The Zeppelin raid on England served to introduce several weapons never before used in warfare. The equipment for dropping bombs from these aircraft is much more complicated than might be imagined. The bombs are not dropped over the side, but are discharged from the bottom of the car or cabin with scientific accuracy. The device employed consists of a plate with three apertures, through which the bombs are dropped in an exactly perpendicular direction. The device may be said to be triple barrelled, and the bombs may be dropped in rapid succession, or two or even three at a time. The mechanism for releasing the bombs is controlled by three pedals, thus leaving the operator's hands free. The man controlling the apparatus sights the object of attack beneath him, and starts the bomb on its downward flight with a touch of the foot. Great care must be taken in aiming, since the bomb on leaving the rapidly moving aircraft does not fall straight, but describes a parabola. The device may be loaded and discharged in a few seconds. Several special guns have been invented for repelling the attacks of aircraft. One of the most efficient throws a shell which explodes, emitting a shell which, in turn, explodes, and this continues until five different shells have scattered their contents. At each explosion a quantity of shrapnel is scattered in every direction over a wide area. The successive explosions suggest the action of a Roman candle which scatters sparks by a series of explosions. If any one of these explosions is near the airship it is pretty certain to be struck.

[Current Notes on the War. Aero Attack on Strassburg, Apr. 16, 1915. Editorial. *Artill. Monatshefte,* June, '15.]

A hostile airship dropped eight bombs of heavy caliber. Luckily only one fell on a building. The remainder struck in the streets or yards. Seven persons were wounded.

—Aerial—Incendiary

[Incendiary Bombs. *Sphere,* June 5, '15. 150 words. Illus.]

Several kinds of bombs are dropped by Zeppelins, some explosive and some incendiary. The latter are as a rule 10 inches in diameter, conical in form with handle and ignition apparatus at the apex. The base is a flat metal cup, from which rises a pierced metal funnel containing thermit. Packed about the funnel is a layer of inflammable resinous material, wrapped spirally with an inflammable form of rope. In some cases celluloid chippings or a small quantity of petrol are added. There is generally some melted white phosphorus in the base to produce nauseous fumes.

—Aerial—Launching of

[Throwing of Bombs from Aeroplanes; and the Construction of Bombs. *Memorial de Ingenieros del Ejército,* May, '15. 1500 words. Diagrs.]

The initial velocity and direction of a projectile launched from an aeroplane are the resultants of the absolute velocity and direction of the machine and the action of gravity. By "absolute velocity" is here meant the actual rate of speed, which, of course depends on the rate in perfectly still air as affected by the air currents.

Accurate aerial bombardment depends simply on releasing the projectile at the proper instant.

The projectile here described consists of the bomb proper and the fuse, which are carried separately until the moment of launching. The bomb is pear shaped, the walls being of steel of sufficient strength to prevent bursting on shock. The bursting charge is trilite, and the shell usually carries small steel balls, varying in number with the size of the bomb.

A cylinder is screwed into the neck of the bomb, extending completely to the large end, containing the explosive in the inner end, and having an interior screw thread at the outer (small) end of the bomb, to hold a percussion fuse. The bullets are contained between the cylinder and the outer walls.

The mechanism of the fuse is so arranged that the bomb must fall a distance of 100 meters before the fulminating cap approaches near enough to the striker to be ignited by shock. This approach of the cap is effected by means of a screw propeller that is acted on by the air during the fall. The explosion, therefore, cannot take place within 100 meters of the machine, and this is the minimum elevation of the aeroplane in action.

Against living targets bombs are used which carry steel arrows, and smoke bombs give artillery range.

The sighting apparatus has a camera finder on which is a graduated scale so arranged that if the image of the object appears, for instance, at the graduation 200, the horizontal dis-

tance to the target is twice the vertical distance; and if the image coincides with the graduation 100, the horizontal and vertical distances are equal.

The barometer gives the altitude; and to calculate the speed of the machine it is necessary only to take the time of the passage of an image along one hundred points of the graduation of the scale, which will give the time of flying a distance equal to the altitude.

Knowing the altitude and speed of the machine, by means of tables the proper moment of launching the projectile is indicated. Refinements of the methods are numerous.

[Early Experiments at Launching Torpedoes From an Aeroplane. By Capt. A. Guidoni, Italian Navy. *Flying*, June '15. 1000 words. Illus. Diagrs.]

The purpose of the author was to determine the influence upon the aspect and speed of an aeroplane of the dropping of a body whose weight constituted the maximum allowed to the aeroplane's carrying capacity. The article is mathematical, and discusses circumstances of motion and conditions of equilibrium. The machine used was a Farman military, M. 1910. The practical conclusion is that inasmuch as a weight of 120 k. was dropped in perfect safety, it would have been possible to go as high as 160 k., and that with machines weighing 2000-3000 k. weights ranging from 400-700 k. can be safely dropped.

—Aerial—Velocity of

[Aerial Bombs and Projectiles. *Aeronautics*, June 15, '15.]

A chart representing graphically time-, distance-, and velocity-relation, based on the formulæ for falling bodies.

BOY SCOUTS

Great Britain

Boy Scouts engaged in the British navy for signalling were said to have received more pay than midshipmen (Mar.) More than 12,000 scouts have entered military service of one kind or another, and 2000 more who are nearing the age of enlistment are in training.

At the outbreak of the war the Scouts by thousands guarded telegraphs, telephones and bridges, served as messengers, and performed countless duties of value to the War Office and the Admiralty. More than 5000 medals have been given to Scouts who performed not fewer than twenty-eight days' service. About 50,000 boys have served a lesser number of days.

The sea branch of the movement volunteered to carry out the duties of the coast guardsmen, recalled to the fleet, and they were detailed to duties on the east coast. This required more boys than this branch could supply, so the land scouts joined, and in March 1600 boys were so employed in patrols of eight under their own leaders and with their own equipment.

United States

A bill to incorporate the Boy Scouts of America under a Federal charter was favorably reported, Feb. 2, by the United States House Judiciary Committee.

BRAZIL

—Army

[Projected Modification of the Law of Military Service in Brazil. By Col. Tasso Fragoso. *Boletim Mensal*, Feb, '15. 6660 words.]

This is one of many projects advanced by Brazilian army officers to provide their country with the necessary trained personnel for both land and sea forces. The full text is of interest only to those who are specializing in military legislation, and conditions are so different in Brazil that many of the features incident to military development there are inapplicable in North America.

The project calls for service in the army or navy except for those who have been tried and found guilty under certain sections of the criminal code or of crimes involving a minimum of two years imprisonment.

Service is rendered as follows:

I. In the Army:
1. First line, 10 years, age 21 to 30 incl.
2. Second line, 10 years, age 31 to 40 incl.
3. Third line, 5 years, age 41 to 45 incl.

II. In the Navy:
1. Active navy, 2 years, age 21 to 22 incl.
2. Naval Reserve, 23 years, age 23 to 45 incl.

—Army—Infantry

See
INFANTRY—DRILL REGULATIONS—BRAZIL

BRIDGES, MILITARY

[Bridge Constructed in the Field to Carry Motor Lorries, etc. *Royal Engineers' Journal*. Mar 15. 800 words; 1 drawing; 1 photograph.]

This bridge was built by a detachment of Royal Engineers, to replace a steel bridge destroyed by the Germans. As there were available plenty of 3 in. x 9 in. timbers and a small supply of steel bars and plate, a timber bridge with steel ties was decided upon.

The bridge crosses a canal with a towpath on each side, so that the total span of 124½ ft. could be subdivided into a main span of 66½ ft. and four short approach spans. The bridge was designed to take a motor lorry with 13 ft. wheel base, 17,000 lbs. on one axle and 7000 lbs. on the other.

The big girders, four in number, were 6½ ft. deep and weighed two tons apiece. Built lying flat, each was then turned on edge, one end slid out onto a barge and thus carried across, the girder pivoting on a shoe, and its further end being lifted into place by a derrick.

Work was in progress for 20 days; it was uninterrupted by the enemy, though one or two hostile aeroplanes passed over. Total working time, 2000 man-hours.

Experience with this bridge suggests that under similar circumstances a through bridge having only two girders would be preferable in ease of construction and rapidity of erection, provided only that tackle be available for handling the heavier girders.

BRIDGES—Continued

[A Temporary Bridge. *Memorial de Ingenieros del Ejército*. Madrid. April, 1915. 1200 words. Plans and Specifications.]

The bridge here described was used by the English engineers recently to replace one destroyed by the Germans over a canal; the latter bridge being of metal and carrying a highway and tramway.

A temporary ponton bridge on the site proved insufficient to carry the traffic, thus necessitating a semi-permanent structure. The canal has a towpath on each bank, so that the approaches to the canal had to be at least two meters in height, with the lower chords of the center span about the same distance from the main water level of the canal.

Near the site of the old bridge were a shop and a storehouse with a supply of small dimension iron, the largest being 22.5x7.5 centimeters and of different lengths, which could be utilized in constructing a bridge of five spans.

The middle span, crossing the canal, consisted of four trusses, the upper and lower chords of each being wooden beams reinforced with iron, the upper chords carrying the roadway, the span being of strength sufficient to carry a rolling load of 10½ tons on a vehicle with 3.9 meters between axles.

The southern side of the bridge was exposed to the enemy's direct artillery fire, and was armored as strongly as possible.

The center span was 19.95 m. in length, and each of the spans of the approach—two on each bank—was 4.35 m. in length. The width of the canal was 16.8 m., and the width of the towpath on each bank 3 m. The piers were built up log cabin fashion.

(The dimension specifications of the members are shown on the plans.)

The bridge was built in twenty days, and precautions had to be observed constantly to protect the workmen and material from destruction by the German artillery.

[Bridge Repair by Kamerun Expeditionary Force. By Royal Engineer officer. *Royal Engineers Jour.*, May '15. 150 words. 2 photos.]

On their retirement from Duala the Germans cut two spans of the 5-span girder bridge 1000 ft. long at Japoma over the river Dibamba. The repair was made by a French Railway Section from French Guinea. The center span presented the most difficulty, owing to the 20-ft. depth of water and the 3-knot current. Piles were driven to support the existing girders in their fallen positions; timber trestles were then erected on the upper flange of the dropped portion of the girder, and traffic has been running regularly since. [Well illustrated by photos.]

[Construction of Bridges in the Field to Take Heavy Motor Transport. By Capt. G. C. Gowlland, R. E. *Royal Engineers' Jour.*, July '15. 3800 words. 5 drawings.]

Motor lorries are now to be regarded as a regular form of field transport, and field engineers must be prepared to build semi-permanent bridges able to carry a train of the heaviest lorries, using the material at hand such as planks, round or flat steel or iron bars, spikes, etc. The type of design will depend upon the material at hand. No attempt is made to present a type design. A span of 40 feet is assumed and three methods of bridging it are suggested. Each lorry is assumed to have 6 ft. 8½ in. track by 13 ft. between axles. Load on front axle 7100 lbs, rear axle 17,700 lbs. When crowded, 10-ft. space is assumed as distance between lorries. Assumed stress on wood is 1200 lbs. per sq. in. in tension or compression, steel 7½ tons per sq. in. in tension. On 40-foot span under assumed conditions, two lorries can be on the bridge at once.

The maximum bending moment (B. M.) is found by the principle that with a series of concentrated loads at fixed distances apart, the maximum B. M. occurs when the center of the beam bisects the distance between the center of gravity of the combined loads and the load under which the maximum B. M. occurs. Under the conditions a maximum B. M. of 233,925 ft.-lbs. is calculated. Doubling for the equivalent dead load, the maximum B. M. for design is 467,850 lbs.

Case I.—Assuming plenty of round steel bars, planking, and means of cutting threads. The form selected is the N girder (Pratt truss), using steel rods as ties and carrying roadway on top chord. The equivalent uniformly distributed load for equal B. M. is 2339 lbs. per running foot. Using a 5x5-ft. panel, the panel load for each girder may be taken as 6000 lbs. Dead load due to weight of girder is assumed as 420 lbs. per panel. All stresses in the members are then calculated by the method of sections. After determining the stresses, it is concluded to use four girders to lessen the stresses and simplify the joints.

The greatest stress in chords is 25,680 lbs. Three 3x9-in. fir planks are used for convenience. Twelve ¾-in. bolts (2700 lbs. each), 162 6-in. nails (200 lbs. each) or 46 7-in. spikes (700 lbs. each) are necessary on each side of the joint. The heaviest tensile stress in the diagonals (15,729 lbs.) requires a 1⅜-in. steel rod. The greatest stress in the verticals is 12,840 lbs., requiring a 3x9-in. fir plank. The top and bottom chords are thus designed of three 3x9-in. planks set on edge and secured together as stated. The verticals are set with width perpendicular to roadway and secured to chords by cleats. The chords are bored for the diagonals and oak blocks set on the chords to take the bearing of the nuts through ½-in. steel plates.

Case II.—Using flat steel bars instead of round. The difficulty of jointing with flat steel bars will be apparent, especially where the stresses are heavy. By using eight girders and overlapping them endwise by a half panel length, there result stresses only half as large as those previously calculated for the vertical and diagonal members, the stresses in the chords remaining the same. The diagonals can be made of two 2x¼-in. steel

bars bored for two ¾-in. bolts or screws, the maximum stress being 7864 lbs.

Case III.—No steel available except in the form of bolts. In this case four plank box girders of 30-in effective depth (39 inches deep over all) are used. The top and bottom chords of this girder consist each of three 3 x 9-in. planks edge up, with 3 x 9-in. verticals 20 inches apart on centers. The box is completed by two layers of ½-in. planks inclined in opposite directions on 45° diagonals. These two layers are nailed together and nails clinched. Only one layer need be used in the middle half of the girders. The side planking of the girder is bolted to the top and bottom chords and the planks of the chords are secured together by ¾-in. bolts 3 inches apart, passing horizontally through the chords on the center line. 4 x 4 x 9-in. blocks are set between the plank webs in the centers of the end panels to stiffen the web. The two verticals at the ends of the girder are set 10 inches apart.

In a recent article from the front, it was stated that it is simpler to carry the load on the bottom chord. In any case there will be difficulty with the transoms and flooring unless steel beams are used, and if timber only is available, it appears impracticable to carry the load on the bottom chord. If four girders are used, it is much more difficult to distribute the load equally if carried on the bottom chord than if carried on the top chord.

A single girder of *Case II* was tested with a 6½-ton central load on a span of 50 feet. Deflection 3 inches, permanent set 1½ inch. With a central load of 13 tons, the deflection was 6 inches and the permanent set 2 inches. Weight of experimental girder 2500 lbs.

(Note: The calculation of stresses and full drawings showing details of design are given in the original article.)

[Construction of Bridges in the Field to take Heavy Motor Transport. By Capt. G. C. Gowlland, R. E. *Royal Engineers' Jour.* Aug., '15. 2500 words. 3 plates. 3 photos.]

Two forms of girder are here suggested, built entirely of wood, so designed that four girders would be required to carry the heaviest motor traffic over a 50-ft. gap.

Assumptions,—load on front axle of lorry 7,100 lbs.; on rear axle, 17,700 lbs.; distance between axles, 13 ft., distance between lorries, 10 ft.

Maximum bending moment under assumed loading is 352,500 ft.-lbs. Multiplying by 3-2, the maximum bending moment corresponding to the load is 528,750 ft.-lbs. This is the bending moment produced by an evenly distributed load of 84,600 lbs. Supposing eight N girders (Pratt truss) each weighing 1¼ tons, be planned to carry the lorries, the stresses are then worked out by the method of sections. Next supposing two of these girders be placed on top of each other, with the diagonals running in opposite directions, and lashed together, the stresses are thus determined which would be taken by each of four built-up girders of the double Warren type.

Boom. Maximum stress in compression or tension is 34,300 lbs. One 9 in. x 3 in. fir timber is quite safe in tension, and with a continuous cover-plate the compression boom will be safe, with an area of 54 sq. in.

Joints. Twelve ¾-in. round iron drift bolts are necessary, staggered, on each side of every joint in the boom.

Ties. Maximum tension in a tie is 9000 lbs. Two 4-in. x 1-in. battens, one on each side of the boom, will be safe.

Tie fastenings. Three ⅝-in. coach screws at the end of each tie will be safe.

Struts. These are of 2-in. x 1-in. and 7-in. x 2-in. material.

Verticals. Of 7-in. x 2-in. timber.

[The details of the girder, and each of its joints, are given fully in the figures.]

An experimental girder as above was loaded so as to represent a 16-ton traction engine. The deflection was 1½ in., with no appreciable permanent deflection.

[A double lattice girder is then evolved by superposition of the Warren types already considered, and its details illustrated. An experimental girder of this type was also successfully tested.]

—Bridging Equipment

[An Accessory to the Bridging Equipment. By Lieut. G. Le Q. Martel, R. E. *Royal Engineers Jour.*, Aug., '15. 800 words. 4 figs.]

As the balk carried by a British field company of engineers are only 15 ft. long, a support has to be used in the frequently occurring case of a small river 15 to 20 ft. wide. For this reason a collar has been devised for joining two balk side by side, by the use of which, with five pair of balk, it is possible to bridge a 19 ft. gap for field guns or infantry in fours. It is also useful when the last span is just over 15 ft. in saving the use of an additional ponton or trestle.

The figures show the details of the collar, which is simply a strap of 2"x⅜" iron, and a wooden block, both bored for an iron pin which prevents the collar from slipping. With the batten balk, the balk must be placed with battens opposite each other, and the parts assembled in a certain order—all of which is clear from the drawings. The connections can be readily made in a few minutes.

Calculations are given to show that, assuming the ordinary 15 ft. span safe for infantry in fours crowded on the bridge, a 19-ft. span of the double balk with collars is also safe for similar conditions. In fact, actual loading tests of such a span have been made, with satisfactory results.

—Christensen Matériel for

[New Light Matériel for Campaign Bridges. *Revista Militar,* Mar, '15. 2500 words. Woodcuts.]

Description of the Christensen bridge matériel invented by Captain P. Christensen of the Danish Army. This system consists of specially designed rafts which can be joined together so as to form the single bridge, the double bridge and the flying bridge or rope ferry.

CANADA—Continued

[Notes on the War in Europe. *Army & Navy Jour.* May 1, 1915.]

Canada had (April 10), 101,000 men under arms.

[Notes on the War. *Army & Navy Jour.*, June 12, '15. 100 words.]

The Canadian minister of militia announces that an effort will be made to raise 27 additional regiments of infantry and 6 batteries of artillery, about 35,000 men. This will bring the Canadian force to about 150,000. The Canadian losses have been 1213 killed, 5230 wounded, and 1565 missing.

CANALS

See also
KIEL CANAL

CARTRIDGE CASES

See
SHRAPNEL—CARTRIDGE CASES

—For Rifle Ammunition

See
INFANTRY—ARMS—AMMUNITION

CASUALTIES

See subhead LOSSES *under names of specific Wars, Campaigns and Battles*
See also
WAR—LOSSES IN

CAVALRY

[*Note, for a rapid survey of the material under* CAVALRY, *that it is distributed on the pages indicated under the following geographical and subject subheads:*

Note also for much other valuable material on CAVALRY *the cross-references, not only after the General material under this head, but also after the material under many of the* CAVALRY *subheads.*]

[Cavalry. By Friedrich von Bernhardi. *Jour. Military Service Inst. U. S.* Jan-Feb, '15. A review by Gen. E. J. McClernand, U.S.A. 3000 words.]

Von Bernhardi's book on Cavalry has a preface by Sir John French, now commanding the British Army in the field. Von Bernhardi holds to the American view of the value of fire action of cavalry, and inasmuch as there has not been since the Civil War an opportunity for our officers to handle masses of cavalry, this work is especially valuable. Gen. McClernand states his belief that using cavalry as "divisional cavalry" is a mistake, and points to the Virginia campaigns up to the time Hooker took command to illustrate the fallacy of scattering cavalry forces. Von Bernhardi refers to mobility and shock action as essentials, and Gen. McClernand quotes his words appreciatively.

Mounted reconnaissance is an important item in good cavalry employment, and the care of horses in this work is especially important. During our Civil War horses were expended unnecessarily lavishly.

Screening consists of the offensive and defensive screen, the defensive being preferred.

The rôle of cavalry has varied somewhat in the last few years, due to the improvements in firearms and the comparative weakness numerically of the cavalry arm, though in the action of cavalry against cavalry there has been no change.

Close, cohesive double rank formations are best for attacks on cavalry, while looser lines are essential for attacking infantry and artillery.

Independent cavalry must not depend on infantry for support, and a cycle corps is recommended.

In order to have a maximum strength present in a battle, a large proportion of absentees must always be provided as extra men.

The relative merits of the lance and sword are much discussed in Europe and opinion is divided. The lance is not suitable for American cavalry.

It has been deemed advisable to add the bayonet to the armament of a cavalryman, but Sir John French favors its use only in defense of camp and on outpost. However, when the curtain rises from the present war, and the censor permits us more news, the necessity for the bayonet may be more apparent, in order to put a cavalryman on an equal footing with an infantryman in close fighting.

[Practical Advice to the Cavalryman. By Col. Marziale Bianchi d'Adda. *Rivista di Cavalleria,* May, '15. 4300 words.]

Captain DeSezille, of the French cavalry, who claims to have been in most of the important cavalry engagements at the beginning of the war, has written a book containing his observations and some practical advice for the use of the cavalry. All of his remarks apply to small commands and are inapplicable to large commands. In the first part of the book he discusses the use of cavalry mounted and in the second its use as infantry in connection with trench work. Only the first part is treated in this article.

Marches and Halts.—Within nine kilometers of the enemy's troops the greatest care should be taken to watch for hostile aeroplanes and

to guard against sudden attacks. No assemblies of troops should be allowed in the open. On the approach of a hostile aeroplane the men disperse immediately, taking advantage of any available cover. If the aeroplane flies low enough a squad of men under an officer may be ordered out to fire at it. If no cover is available the men should divide themselves quickly into small groups separated about 150 m. from each other.

Marching on the Road and on Varied Ground.—The columns should be opened out as much as possible. If ground and circumstances permit, the troops should be marched along parallel roads. When stopping in small towns care should be taken that the men and horses remain concealed. None of the inhabitants should be allowed to leave the town while the troops are there. In open country, advantage should be taken of any available shelter, and the men should be protected against artillery fire by constructing shelters of alternate layers of earth and wood.

Security and Protection.—When within range of the heavy artillery of the enemy, great care should be taken that the flanks of the column are protected for some distance. The patrols sent out should be strong enough to search all covered positions on the line of march. Scouts should keep off the crests of hills as much as possible. When on vedette duty, one man remains out of sight behind the crest with the two horses while the other conceals himself on the crest and observes. Trees and haystacks are good observing points. One man in rear of any reconnoitering group should keep his rifle in his hand always ready to fire as a signal. Woods should be reconnoitered for some distance from their borders. When a village is to be passed, the streets are examined and in extreme cases the houses.

The foregoing remarks apply to large reconnoitering squads. As they move along the road, they keep a careful watch down all cross roads. They should be careful not to close up on their advance scouts. Contact with the enemy having been established, the squad picks out a good concealed position but keeps one or two men observing the enemy. To prevent attacks by armed cyclists or armored automobiles, barriers may be constructed by putting obstructions across the road.

Stopping for the night in a factory or small house, the men and horses are kept ready to move immediately. The factory or house is surrounded with an iron wire or other obstacle. In hostile country, the mayor of the town and the funds of the hostile government would be held. Telegraph offices and post-offices are taken charge of.

Combats.—The author devotes only two pages of his book to this subject. He cautions against following the enemy too far for fear that it might only be a trap to draw the pursuer into a position where the hostile artillery and mitrailleuse could inflict great losses.

[Leaves from a Squadron Diary. By Sponedoro. *Rivista di Cavalleria,* Apr., '15. 3000 words.]

Assignment of newly promoted corporals.—Heretofore a certain number of corporals have been selected in the squadron to serve in their own organization. It is suggested that better results would be obtained if corporals were selected by examination from the whole regiment, as some squadrons have more men worthy of being selected than others.

The field glasses of the squadron.—The cavalry although it is called the eyes of the army is equipped with miserable field glasses. They are not worth the parcel post necessary to send them to Turin to be repaired. Several officers have purchased their own glasses, but this should not be necessary.

Repair of linen.—It has been noticed that a great many shirts turned in to be repaired have a small strip of cloth missing. One day a man was seen bringing a pair of shoes to the cobbler to be soled. They were marked with a strip of cloth, which had been torn from his shirt. Much expense in repairing linen has been saved by issuing a metal tag to each man to tie on his shoes when left to be repaired.

The mobilization of officers and their mounts.—Every effort should be made to provide as much comfort for the officer and his mount as possible. In order that in times of stress the officer may offer a proper example to his men, he must be in the best possible condition mentally and physically. The cavalry officer is better able than his dismounted comrade to do this for he may provide himself with a thoroughbred that will make him show up to better advantage. The officer should have his equipment and personal property carefully prepared beforehand so that when ordered to take the field nothing will be lacking.

[A list of articles to be carried follows.]

See also

EQUITATION
HORSES
JUMPING.

France

[Report upon Year Spent with French Cavalry. By a Cavalry Officer Abroad. *Jour. U. S. Cavalry Assn.* 9000 words.]

The article is prefaced with suggestions as to procedure, uniforms, equipment, etc., for the assistance of officers who may go on such details abroad. It is based upon experience with a particular regiment—the Sixth Dragoons. The French, like the Germans, now have a three year term of service, each having tried two years and found it too short for the cavalry. The difficulty lies not so much in the fact that the individual soldiers can not, as a rule, be trained in the shorter period or, possibly, in less. It is to be found, rather, in the fact that, if each man be discharged after what is considered the shortest average period to fit men for the field, the command as a whole can never be ready for the field; and troop officers and non-commissioned officers can never get sufficiently away from the minutiae of recruit instruction to devote proper time and attention to those duties in problems and maneuvers that will develop them and fit them for command in the field. Other serious objections to the shorter term of service, now discontinued, are the larger

CAVALRY—Continued

proportion of horses annually subjected to the wear and tear of recruit instruction and the difficulty in finding a sufficient number of suitable available men to train remounts. About Oct 1 of each year recruits arrive, in strength approximately equal to one third of the organization. This both permits regular, progressive instruction and prevents a troop being denuded at any time of any excessive proportion of its trained men—features that could well be adopted in our service.

Remounts are similarly received each fall and at once started, in each *escadron,* upon a two years' course of training—the first-year horses under one officer, the second-year horses under another. The course is simple but thorough—the horses are carefully bitted, taught to jump and to obey the aids. The remounts are generally well-bred horses from four to five years old, varying in size according to the type of cavalry to which assigned. Probably the most noticeable difference between French and American cavalry stables is the use of stone floors in the former. This avoids holes and inequalities in the flooring of the stalls; and, as bedding is liberally supplied and not wasted, the horse has always a nice soft bed, the hard floors tend toward cleanliness and the net result is a distinct advantage over our dirt floors. A consideration of the good practical results in shoeing, obtained in spite of constant violation of the prohibitions of our manuals, leads to the conclusion that, "care in putting on the shoe so it will stay and frequent shoeing" are the most important essentials. Bridles and bits are superior to either our old or new models. The trooper's saddle is considered uncomfortable for both man and horse, produces as many sore backs as ours and in other ways is not so good. The officer's saddle is considered, perhaps, the finest of all armies. "We would do well to imitate it just as it is without alteration." The French trooper always carries his stable clothes on his saddle and uses them, when dismounted for the day or night, to protect his other clothing. Barrack accommodations vary in different localities but are not so comfortable as ours. The American soldier has much the better of it as regards rations.

Roll calls and formations, except for drill, appear limited to a daily assembly, regulated by the captain of each *escadron.* At this formation, orders are published, punishments promulgated, etc. Offenses appear few and discipline good. Serious offenses of criminal nature are dealt with by commissions composed of officers. For lesser infractions of discipline, both officers and non-commissioned officers have power to award punishment, such power varying, with rank, from that of a corporal (who can give two day's confinement to barracks) to that of a captain, whose power extends to thirty days of such confinement or eight days in the town jail. All such punishments must be approved by the colonel. In both administration and instruction, the principle of reasonable liberty as to detailed methods, with corresponding responsibility as to results, appears applicable to all grades from colonel down. In instruction, "the great impressive thing which one immediately notes in the French service is the uninterrupted, careful, patient, unhurried, progressive scheme of instruction, commencing each year on the first of October and ending in the maneuvers in the following September." Each unit—platoon, *escadron,* regiment—has its definite period of instruction as such. In addition, during the school of the *escadron,* the captain usually turns over the platoons to their commanders for two or three days per week, and the colonel similarly turns over the *escadrons* to the captain during certain days of each week of regimental training. In the platoon, instructions is chiefly individual, with equitation preponderating—the methods simple, but thorough. Other subjects are ordinary dismounted drill, calisthenics, grooming, care of arms and equipments, target practice (distributed throughout the year), and preparation for field service. This latter is very practical, progressive and thorough. Work was carried on under schedules made out by the captain from which tables of work were prepared in convenient graphical form. The men usually rose about from 5.30 to 6.00 a. m. and morning work was over by 10.00 to 10.30. Afternoon work began about 12.15 and was over about 5.00. Not all the men, however, worked all this time. "The men work no harder nor longer than ours do but they accomplish much by a progressive system." There are special classes of both officers and non-commissioned officers in fencing, equitation, etc. The platoons are inspected by the colonel each January to ascertain the progress made and each squadron is similarly inspected a few months later. The brigade commander inspects each platoon and each squadron in March. An inspection by a major-general of cavalry in June included the school of the regiment and a field exercise by the latter, a performance by each *escadron,* the riding and fencing classes, and administrative work.

In addition to the classes and practical work already referred to, officers participate twice a month in war games, terrain exercises, tactical rides or field exercises, according to the weather and stage of instruction. The colonel or brigade commander conducts these; and, whenever they include the handling of the combined arms, at least one officer of each arm represented is present. There is nothing similar to our fixed garrison school courses for officers, though n. c. o. schools similar to ours are held. Young officers, and n. c. o.'s are given out-of-doors instruction in giving commands; and two days of each year are spent in instruction in demolitions.

Each soldier is armed with a short carbine and a straight sword with one cuttting edge. Officers and n. c. o.'s carry the revolver in addition to the sword. Neither carbine nor revolver is accurate. Apparent better results with the sword than among our men are due less to swordsmanship than to equitation. The point is used almost exclusively and no attempt is made toward expert fencing on the part of the men other than n. c. o.'s. A few simple night ex-

ercises are held. In these last, the main points emphasized seem to be the keeping touch, by connecting files, between elements of a command, and teaching men to follow accurately the route set by leading elements. Very little instruction in passing from mounted to dismounted action is given—everything has the mounted attack in view. "Their patrols armed with the sword would be playthings . . . in the hands of our patrols armed with automatic pistols." The real point in which the French cavalry is superior to ours is in the equitation of the average trooper—and there is no reason why ours cannot be made as good.

"No hobbies of individual officers appear to dominate their scheme of instruction."

"No competition is allowed between *escadrons* or between platoons in the *escadron.* At least, they are never graded for military proficiency because they believe this creates jealousy and accomplishes no good purpose. Emulation is encouraged and is believed to be a different thing." There is, however, a standard below which an organization must not fall.

In comparing the French and German cavalry, it is noted that the former suggests rather ease and suppleness in their mounted work, the latter uniformity and precision. Both ride with legs well back. The Germans incline to the lance, the French to the saber.

"In war between the two it is a question whether the French *élan* or the German regularity and method would gain the upper hand in a cavalry combat of equal numbers."

"I cannot help believing that both are on the wrong track and that opposed to equal numbers of our cavalry, if our horse training and equitation improves as it promises to, and if we hold to our own ideas of organization, increasing rather than reducing the size of our regiments, and using pistols and rifles for both mounted and dismounted work, the French or German cavalry would fail, and in three months would abandon every lance so that there could not be found one in either army. The saber might possibly be retained to use in combination with the pistol. In our service it should always be held in subordination to our fire arms."

"If we adopt French organization and French tactics, we shall abandon that peculiar superiority, at least for our special conditions and terrain, which we have developed accidentally or otherwise in this country, and we shall be taking a step backward instead of forward."

[In addition to the above general matter, there are included in the article notes in the nature of description and pertinent comment with reference to the details of the brigade maneuvers and the maneuvers of the cavalry division.]

United States

[Cavalry Organization. By Capt. S. D. Rockenbach, 11th Cavalry, *Jour. U. S. Cav. Ass'n.,* July '15. 2500 words.]

There is one object in organizing a military force—success in battle, maximum loss to the enemy in the least possible time and with a minimum loss to ourselves.

In our Civil War, we developed a cavalry force and organization psychologically suited to the American soldier and our own terrain, and great versatile cavalry leaders who surpassed all others in the diversified employment of cavalry.

The great lesson of the Civil War and of the Spanish-American War was that we need a reserve for the Regular Army, but first of all, we need a reserve *in* the Regular Army. The Regular Army went to Cuba 50 per cent recruits and only 50 per cent efficient. It was gone in a month for further offensive action, due to the lack of depot battalions to replenish it.

In time of peace, the German cavalry division has 4 brigades of 2 to 3 regiments of 5 squadrons and of 5 platoons. In time of war (for combat) the cavalry division has 3 brigades of 2 regiments of 4 squadrons. In time of war the trained excess regiments are organized into new divisions or used as divisional regiments, and the 5th squadrons become the depot squadrons.

A sample of cavalry in our service shows 41 men for duty at combat drill, out of a aggregate of 83. With these conditions, the officers do not get the training in handling troops that they should. It is clear that the strength of the troop should be such that, with all deductions for sick, absent, special duty and the like, there still is a full quota for drill. This excess is even more necessary in time of war. (Follows a table of the strength of the various arms of the German Army and one of the War Organization of the German Cavalry and a plea for the instruction of the public as to its lack of protection.)

[Cavalry Drill and Service Regulations. Memo. War Dept. *Army and Navy Jour.* Sept. 11, '15. 600 words.]

The War Department announces in a memorandum the results of a canvass of officers of the cavalry arm on the question of organization and regulation. Of 815 officers reporting, 615 favor the present legal organization with revision of the Cavalry Drill Regulations of 1909 and adopting portions of the (experimental) Cavalry Service Regulations of 1914. 56 officers favored the present legal organization and Drill Regulations of 1909. 82 favored the new organization and (experimental) Cavalry Service Regulations of 1914. 64 had no opinion to express.

—Arms

[The Proper Weapons for Cavalry. Lieut. R. Gerbex. *Revue Militaire Suisse.* May '15. 1000 words.]

The following suggestions are the result of five months active service, supplemented by many conversations with brother officers of similar experience.

In spite of general good work by our [Swiss] cavalry, certain handicaps and defects are apparent. Our units are, as a rule, smaller than corresponding ones in other services, necessitating greater activity on our part. Our mounts will therefore suffer more, added to which is the handicap of lack of desired

CAVALRY—Continued

breeding in most of our cavalry horses. Furthermore, our armament requires modification. One of our patrols opposed by a similar hostile element would be at a double disadvantage, due to probable numerical inferiority and to the advantage of the hostile lances over our sabers. The isolated dispatch carrier, seeking to reach his destination on a worn-out horse, would be very helpless against opposing troopers. "Men engaged on any special mission must be armed with a pistol or revolver if we expect our service of information to work satisfactorily and succeed in getting to us needed information." The cavalryman, armed only with the saber, and dismounted or separated from his mount, is without a weapon. If the increased expense will not permit arming all of our troopers with a pistol or revolver, a portion at least of each *escadron*, chosen from the best mounted men, should be so armed. These men would then be utilized for all detached and special service.

The carbine should be carried on the near side of the saddle, instead of on the off side as obtains in our service. In some foreign services, the carbine is still slung across the trooper's back. This was practicable with a small and light weapon, but the plain modern tendency is to ultimately carry the carbine suspended from the left side of the saddle. The resultant saving of time when passing from mounted to dismounted action is obvious. Moreover, the right side is the better one on which to carry the saber. Drawing the saber, when the latter is suspended on the left side, almost invariably results, if executed in motion, in a swaying on the horse to the left side due to the displacement of the rider's weight and left hand.

Experience has shown that, in war, cavalry frequently has local or temporary missions analogous to those usually performed by infantry. This suggests the discussion of the advisability of adding some form of bayonet to the trooper's armament. Successful experiments in the improvisation of a cavalry bayonet by suitably attaching the saber to the rifle have been made. [Method is shown in illustration]. The bayonet for cavalry has met with opposition based upon supposed consequent loss of mobility and dash. It is thought that the objection would not be sustained in practice; while for dismounted work the bayonet would be a help. The use of the bayonet would, of course, be exceptional in any case.

—Arms—Pistol

[Use of Automatic Pistol by Cavalry. By 1st Lieut. Charles Burnett, 1st Cavalry, *Jour. U. S. Cav. Assn.*, July '15. 500 words.]

This plan contemplates the use of the pistol mounted while in column of twos (half-squads) against an enemy charging in line (single or double rank) with the saber. The men on the right (odd numbers) fire to the right oblique or right, while those on the left (even numbers) fire to the left oblique or left. It is believed they will have no difficulty in penetrating the enemy's line, either by shooting thei- way through, or, on account of the enemy avoiding the shock. 182 shots fired at such short range ought to produce decisive results.

See also

CAVALRY—COMBAT—USE OF PISTOL IN

—Arms—Sword

[The Sword of the Cavalry. By Lt. Col. J. S. Barrows. *Arms and the Man*, Sept. 2, '15. 2600 words.]

The sword is probably the result of evolution from the club, beveled on one side until an edge was produced or suggested. Always the classic weapon of cavalry, its retention in the U. S. Service has been a matter of much discussion. Two types have always existed, the curved and the straight, one a cutting, the other a thrusting weapon. Of these, the curved or cutting type has always been the favorite in the American cavalry, due possibly in part to the fact that the Americans never were a nation of swordsmen. It has always as it were seemed more natural to the American to swing and chop than to thrust. A compromise however was made by the issue a few years ago of a saber that could be used either for thrusting or for cutting, according to the immediate exigency of the situation. On Feb. 23, '15, a straight saber was approved by the Chief of Staff. This weapon has a double-edged blade 35⅞ inches long, tapering to a sharp point. The guard is closed, covering entire hand, and the gripe is rectangular with milled surface, thus preventing the weapon from turning in the hand. The weight is 2 lbs., 8 oz. Instead of a metal scabbard, one is furnished of wood covered with leather; the entire weapon is so designed as to be noiseless when worn or suspended from the saddle.

In order to make this sword effective as a thrusting weapon, the position of the trooper at "charge saber" has been changed. He now leans down and well forward, with point advanced and reaching some inches in front of the horse's face. This position assures some degree of cover to the trooper, and at the same time makes his thrust more effective.

—Combat

[The Cavalry Combat at Kelly's Ford in 1863. By Maj. Gen. Geo. B. Davis, U. S. A. *Jour. U. S. Cavalry Assn.*, Jan '15. 4200 words.]

Includes: A sketch of the development of the Union cavalry up to Feb '63; a statement of the conditions leading up to the combat described; a description of the terrain near Kelly's Ford; of the minor combat at the crossing; and of the subsequent five-hour fight between Fitzhugh Lee's Confederate cavalry and Averell's cavalry division; with some discussion of the weapons and tactical measures employed. Two points of special interest in this last connection are noted. First, that, "No opportunity presented itself for a charge with sabers," though each commander approached the field with the intention of using such tactics. "The fighting was done with the carbine fired from horseback," with results in-

dicating that such fire "furnishes plenty of noise but is otherwise barren of results." The second point is the fact that, even at the comparatively advanced stage of efficiency reached by the Union Cavalry after nearly two years of war, it took "more than half an hour" to reform, after a successful mounted charge (with carbines), a command composed of less than two regiments."

—Combat—Use of Pistol in

[The Pistol Attack. Capt. H. S. Hawkins, 3rd Cav. *Jour. U. S. Cavalry Assn.* Oct. '15. 5500 words.]

The introduction of the automatic pistol has greatly increased the importance of the mounted action of cavalry. "Whatever may be the merits or demerits of the *arme blanche*, the *automatic pistol* is a weapon capable of making a cavalry, properly trained to its use, most formidable and efficient in its mounted attack." The effective use of the pistol is confined to no special kind of terrain, nor need it be based upon any special assumption as to the combat tactics employed by the enemy. Skill in shooting the pistol is considered easier to acquire, in the case of American cavalry, than skill in handling the saber.

Two general forms for pistol attack present themselves. The first for use against a mounted enemy charging in close order with the saber or lance, involves an advance in close order as long as conditions permit, followed by a deployment as foragers and further rapid advance to a point about 60 yards from the advancing enemy. Here, at an appropriate signal by the chief of the attacking party, each trooper of the latter suddenly pulls his horse up on the haunches, turns to the left about, and rides so as to keep in front of the advancing hostile line. Speed is so regulated after the turn as to permit the enemy to come within close pistol range, preferably 10 yards or less, when firing to the rear is begun. The enemy's line should, under such fire, be gradually broken up and dispersed. His sabers or lances will be useless and the longer he stays in close order, the better target he will present to the pistol. His deployment at this stage will not help him, while it will relieve the firing force of any danger of being overridden. Should the enemy, recognizing defeat, turn and flee, the pistol men also turn and pursue, *each squad leader, in this case, assuming personal control of his squad.* Should ammunition be exhausted before the desired effect on the enemy is obtained, the men should be rallied in the best practicable manner to the flanks or the direction in which they are moving. With three filled magazines, and proper training in reloading while galloping at full speed, this contingency is unlikely. In case of failure, a retreat by squads on radiating lines might draw the enemy into a dispersion that would subject his groups to attack in detail by the reserve or, at least, cause confusion and loss of control in the hostile ranks.

In the second form, which is regarded as of more general and frequent application, the troopers do not turn in front of the enemy but ride home. This form is for use against cavalry deployed as foragers, against infantry or other dismounted enemy, against artillery, convoys, irregular cavalry, etc. The troopers ride with a view to using their pistols at close range, the details varying with the case presented. They may, for instance, ride through a deployed line, pull up, turn about and ride through again. In an attack on a convoy or similar objective, troopers not detailed to attack the escort pull up around the wagons, teams, etc. To provide for meeting certain emergencies,—such as coming suddenly upon marshy ground or a group of buildings occupied by the enemy,—men should be trained to quickly dismount and change from use of the pistol to that of the rifle. Each of the two proposed forms for the pistol attack is to be initiated by the same general commands and means. The ultimate form that the attack takes, and the details of the execution must then be determined by the initiative and judgment of the leader. In connection with the first form of pistol attack described above, the objection may be advanced that, in the mounted attack, the trooper should not be encouraged to turn his back upon the enemy. This apparent objection may be obviated by training and by making clear to the trooper that his turn in front of the enemy is not running away, but an offensive movement whereby the enemy is ultimately closed with under conditions that leave him at the trooper's mercy. It would be very foolish to permit an old saying to the effect that the trooper should "never turn his back upon the enemy" to prevent our developing the most efficient type of tactics for utilizing the automatic pistol. Similarly, the facts of our Civil War utterly disprove any theory that cavalry, efficiently trained for dismounted action, cannot also be trained to the use of bold mounted tactics on occasions when opportunities for the latter are presented.

The pistol attack, as described, is the most inspiriting and dashing form of mounted action and its use will result in imbuing our cavalry with an aggressive and confident spirit that, in view of recent events, may not be attained by training with the saber or lance. The first essential is proper training in equitation, that the horses may be controlled and handled; the second, target practice with a view to skill and safety in manipulating the pistol; the third, proper tactical training that as many pistols as possible may be brought into effective use against the enemy without confusion or interference of troopers with each other.

General principles are: that the pistol should ordinarily be used in action only at ranges not exceeding 10 yards; that the trooper, when riding in front of his opponent and in the same direction, should try to keep his enemy on his right rear; that, in a pistol attack on cavalry in close order, troopers finding themselves, after deployment, beyond the hostile flanks should continue on, turning and riding so as to fire on the flank and rear of

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the enemy; that pistol attacks are habitually made deployed as foragers with three yards as interval; that any one line of an attack should be limited in numbers to the unit for which there is proper deploying space and which is sufficient to cover the enemy with a swarm of foragers, the employment of an unnecessarily long line tending to interference and confusion; that successive lines available for making an attack should be utilized according to local conditions; that in pursuit any formation suited to the gait demanded may be taken, but with a view to deploying and getting within close range before fire is opened unless inability to overtake the enemy makes it necessary for the leader to take other measures—such as halting and opening fire with the rifle; that, in retreat from a pursuing enemy, the unit should be covered by a force small enough to be deployed without loss of time and this force may use pistol fire at ranges not in excess of 150 yards to check the pursuers; that each unit should be led to the attack by its chief, the troopers riding up abreast of the leader when the enemy is reached; that the platoon is the usual fighting unit and the initiative of chiefs of platoons must be encouraged and developed; that, as an essential of the pistol attack is surprise or confusion in the enemy's mind as to the attacking party's intentions, the advance in close order should be continued as long as conditions permit; that the deployment must be made at once when the enemy is suddenly encountered close at hand, or when coming under artillery or rifle fire.

Where obstacles are present, or a roadway the only route open, it may be necessary to charge in column with a front of four or two men; the troopers on the right fire to the right, those on the left, to the left. Squads may be sent forward successively with distances of from 75 to 100 yards. Attacks in column are to be regarded only as expedients in emergencies where lack of time or space prevent deployment.

The pistol attack may be executed by the squadron (troop) acting either alone or in conjunction with other troops. When alone a reserve should be held in close order and combat patrols utilized. The general principles of the platoon attack are applicable.

(Note.—The original article appears as a proposed chapter of the Cavalry Service Regulations and includes the necessary detailed commands, statement of principles, etc., to put into effect the measures suggested.)

—Drill Regulations

See also

CAVALRY—SERVICE REGULATIONS

United States

[What Drill Regulations for the Cavalry. By Major F. C. Marshall and Capt. L. B. Kromer. Comments by Capts. F. Parker and A. N. McClure (about 1200 and 500 words, respectively). *Jour. U. S. Cav. Assn.* Apr., '15 4000 words.]

The terrain of the probable theater of active operations, and the tactics of probable opponents, are most important considerations in fixing upon any system of training for troops. These considerations do not appear to have been given due weight in the preparation of Bulletin 18, W. D., 1912, which is cited in the Preface to the provisional Cavalry Service Regulations (1914) as the basis of those regulations. Our cavalry is scattered in localities distant from each other and presenting different prospective conditions of active service, as well as varying terrains. The troops in the Philippines are practically a constabulary force; those in Hawaii and the Canal Zone have defensive missions. Training in each case should be with reference to the respective local problem. That of the cavalry in the United States "should be for defensive warfare against an enemy approaching our shores in ships." None of these rôles suggests preparation for combat against large bodies of hostile cavalry on ground suitable for shock action.

Offensive warfare by us on the soil of any important military nation is an absurd hypothesis to work upon.

The probable points of hostile attack in the United States would be great centers, such as Boston, New York, Philadelphia and Washington on the Atlantic, and San Francisco, Portland, and the Puget Sound cities on the Pacific coast. The terrain of these general localities does not suggest probable opportunity for shock action of cavalry in masses.

Bulletin 18 tends to give to shock action an importance to which it is not entitled in the training of cavalry having a probable mission such as our mounted troops may expect to face in case of war. It unduly emphasizes "methods of fighting for which there would be but little use, considering our terrain and probable enemies." It is further open to criticism in that it fails properly to emphasize the importance of team work between cavalry and the other arms; it is not in accord with those provisions of the Field Service Regulations indicating the functions of cavalry in campaign; and it confuses the general rôle of cavalry with mere incidents of combat that may arise in carrying out that rôle.

The great point to be kept in mind in cavalry training is team work with the infantry and artillery. The methods that should be employed are those that best tend to that result, due consideration being given to the probable terrain of operations and probable tactics of the enemy. As indicated in the Field Service Regulations (page 13), reconnaissance will usually be the main rôle of our cavalry, though other rôles may fall to it in pursuit, retreat and similar special cases. Defeat of the hostile cavalry may be a necessary feature of successful reconnaissance; and varied methods of fighting—including shock action—may be a feature of such combat. But shock action, on any probable terrain, is apt to be the exception rather than the rule and to be confined to small bodies.

In seeking a suitable system of training, three courses are open: (1) Training in small groups, based largely upon our past experi-

ence (such as in Indian wars), with little attention to team work or probable terrain of action; (2) Training (such as suggested by Bulletin 18), based largely on foreign regulations and terrain and accentuating preparations for shock action in line; (3) Training based primarily upon applicability to the terrain of our probable danger zones, the tactics of our probable enemies, the development of leadership and the emphasizing of team work. The third course is the proper one to pursue; and the present provisional Cavalry Service Regulations, if disassociated from Bulletin 18 and subjected to a few necessary changes, will be found well suited to the ends in view. "The elasticity of application authorized in Par. 2 should not be nullified by such mandatory provisions as that contained in Gen. Principles 'A,' page 17. The horse should not be characterized as our principal weapon, as it is in Par. 790. More than all, team work with infantry and artillery should be emphasized."

Comments of Capt. Frank Parker:

Our cavalry is practically unanimous in the opinion "That team work is the first consideration," that reconnaissances is the principal rôle, and that no manual should, by its provisions hamper the discretion of any commander in the use of his weapons in action. As regards this last point, lines 9 to 14, p. 14, Cav. Ser. Reg., seem to leave commanders complete liberty of action; the provision should be construed as applicable to training, as well as to the employment of cavalry The statement of Par 790, regarding the horse as a "weapon," should be construed broadly as meaning that the horse is the trooper's chief distinctive asset, considering march, maneuvre and combat together With a few possible exceptions, it is not believed that any of our cavalry officers regard shock action as of "paramount importance"; but, *in mounted combat,* aggressive action must be insisted upon, as any other course is negative and dangerous. The importance of terrain as affecting training is recognized; but cavalry well instructed under the general principles should be able readily to adapt itself to any terrain and enemy.

Comments of Capt. A. N. McClure:

The objectionable feature of the provisional Cavalry Service Regulations is the double rank formation. This objection extends not merely to the direct disadvantages incident to the use of double rank (such as the tendency to inattention and resultant poor training of men and horses in the rear rank), but also to the danger of changes in our armament and equipment based on the double rank conceptions. While the features of co-operation, leadership, terrain, signals, etc., are properly receiving increased attention, it is believed that, with a few modifications, the Drill Regulations of 1902 can be adapted to the training of the individual more easily than the Cav. Ser. Reg. of 1914.

[Important Cavalry Boards. *Army and Navy Register.* Sept. 11, '15. 600 words.]

Two boards of cavalry officers, will meet at the War College, and at the Rock Island Arsenal, respectively, each on Nov. 1, the first of cavalry officers to revise and bring up to date the Cavalry drill regulations; the second, of ordnance, cavalry, and field artillery officers, to report on certain saddles, and to consider in general questions of equipment.

—Instruction and training

[Some Impressions of the Mounted Service School. By Gen. Kobbe. *Jour. U. S. Cav. Assn.* Apr., '15. 2300 words.]

The School is favorably located and the courses are essentially practical, consisting chiefly of matter that is valuable in daily routine duty and that should be passed on systematically through intermediate grades to the individual trooper. The different courses, or "Schools," include instruction in equitation, with excellent supplementary courses in horseshoeing and hippologv. and a special course in the duties of bakers and cooks. The School of Equitation—much the most important—includes a regular (or first year) course, a second year course and a course for field officers. The first and third of these are, in general features, very similar. The striking characteristic of the Equitation course appears to be the successful effort to bring about, by constant and soundly guided practice in varied types of riding a secure seat, free from rigidity of any kind, and a satisfactory mutual understanding between man and horse. The results of the system are uniformly good, while much elasticity appears to prevail as to the detailed methods by which results are obtained. The flat saddle, which "conforms more readily to the average back, and is much less conducive to sores," is in universal use. The open metal stirrup, in use with it, is open to objection in that "It is cold, not easily found by the foot if lost at a rough and rapid gait, and may, on occasion, drag the rider." Whatever question or argument may arise as to the general rôles best suited to cavalry, the average American trooper of the past, in spite of his fine achievements, "Rode badly, was not a fighting unit with his horse, and sacrificed a ruinous number of them." Supplement his historic merit by the further training to be had under the methods of the Mounted Service School, provide him with a proper proportion of guns and confident leaders, and "it is not oversanguine to conceive an independent arm, self-sufficient and self-reliant in war."

[Field Officers' Course at the Mounted Service School and Abroad. *Jour. U. S. Cav. Assn.*. Apr., '15.]

[Consists of two reports, one (about 600 words) by Capt. H. R. Richmond, 13th Cavy., the other (about 700 words) by 1st-Lieut. E. L. Gruber, 6th F. A.; descriptive, respectively, of the Field Officers' Course at Saumur, France, and Hanover, Germany.]

[Field Training for Cavalry. Lt.-Col. De Rosey C. Cabell, 10th Cavy. *Jour. U. S. Cavalry Assn.,* Oct. '15. 1500 words.]

Recent bulletins from the office of the Chief of Staff, containing parts of the proposed

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Manual of Training for officers serving with troops, indicate that the course will consist of *garrison training* and *field training*. With the present Garrison School system and the early prospect of a satisfactory drill book, the theoretical and drill parts of the officer's education appear well provided for; but this is not enough to make him a practical soldier. Neither will our system of schools and drills alone make of the enlisted man a practical soldier or efficient instructor of the new men for war. The proposed Manual of Field Training, under "Tactical Handling of Troops," refers to the Drill Regulations and Field Service Regulations as the written guide for that class of training. There should be more concrete and explicit guides for *field training;* details, exact directions and explicit examples are desirable in this connection, not the mere statement of general principles. This is evident from our experiences with drill itself and with range firing.

Our Small Arms Firing Regulations give many illustrative examples of combat firing; and it is understood that the School of Musketry is working out problems for use, not only in actual combat firing and proficiency tests, but also as examples to serve as guides in developing the training of troops in fire action. The same idea should be applied to other parts of Field Training. Its application will require the best work of a board of selected officers, which might well be convened at the same time and place as the board for the revision of the Cavalry Drill Regulations. A published manual of Field Training should result—a work much needed. In the past twenty-five years, there has not been enough advance in progressive, systematic field training. Drill has meanwhile been wisely regulated by orders limiting the amount of close order work, and G. O. 17, W. D., 1913, has indicated in general terms the further training needed. There remain to be worked out the details of applying that order. No Manual of Field Training for this purpose yet exists; brigade commanders must practically improvise one for their regiments. This has been done for the 1st Cavalry Brigade by Gen. James Parker, whose course of training, laid down in several orders and circulars, is a long step in the right direction, though the system is still subject to further advantageous development. "If we had a manual showing the best methods of training scouts, of attack and defense, of managing advance and rearguards, etc., in short the best methods of training in each of the different things we need to know how to do in field training, such a manual would be the same aid to Field Training that a good drill book is to drill. It should contain, besides the methods of doing each of the above things, exercises based upon these methods and perhaps in some cases indicated acceptable solutions. These exercises would be a help even to the best officers; to those officers who lack initiative and ability to originate ideas and methods, they would be a godsend."

(The author suggests, in general terms, how the period available for field training may ordinarily best be utilized, and includes a program of training actually prescribed and followed at his station, together with examples of the exercises later used to test the results of the course of training in the respective units.)

See also

EQUITATION

FORT RILEY MOUNTED SERVICE SCHOOL

—Organization

United States

[Cavalry Reorganization. By Capt. C. A. Bach, 14th Cav. *Jour. U. S. Cav. Assn.* Apr 15. 5000 words.]

Any suitable plan for cavalry reorganization must fulfill the following essential requirements: strength of units equal in peace and war; peace training based solely on preparation for war; maximum adaptability to combination of mounted and dismounted action; simplicity and speed of evolutions; size of units based upon maximum efficiency of control by respective commanders; integrity of units to be preserved as far as possible. The provisional Cav. Service Regulations, considered in their entirety, fail to meet the above requirements. The double rank formation is approved as tending to increased speed of maneuver, effectiveness of mounted charge, and suitability to meet tactics of probable European or Asiatic opponents. The squad and platoon organization is also considered sound. The squadron of the C. S. R., however, should have 3 platoons, thus providing about 100 men for the Captain's command, placing the leader in the favorable position (the center), and reducing the time of evolution required for 4 platoons. Under the regimental organization, the defect of the C. S. R. are: (1) Too many units [6] for the colonel to handle directly; (2) Majors not systematically trained for duties of higher command; (3) effective subdivision not provided for; (4) regiment numerically too weak. Under (1), the Colonel's duties are beyond the ordinary powers of one man; see, e.g., his duties immediately preceding dismounted action as stated in Pars. 489-494, C. S. R. In mounted action the objection is even more apparent, while the defect in either kind of action will be more marked in the stress and changing conditions of action than in peace exercises. Under (2), the major is not given enough command and constant responsibility to develop him—he is apt to deteriorate, instead of progress, in that grade. Under (3), a regiment of three squadrons, each commanded by a major, is believed to present great advantages both from the viewpoint of control and for convenience in making suitable detachments for supports, reserves, guards for led horses, etc. Under (4), a regiment of 768 enlisted men in ranks is not strong enough—a strength of even 1000 is recommended. The brigade organization of the C. S. R. is considered faulty from both of the two important view points—strength and tactics. In any dismounted action, it is likely that one-half regiment would be needed for protection of the artillery, machine guns, led

horses, etc. This would leave only one and one-half regiments for the fighting line, from which again the horse holders must be taken. Brigade action is practically nullified. Gen. von Bernhardi favors a strong 3 reg't brigade and Gen. French is of like opinion. There is recommended a proposed organization as follows: The squadron (commanded by a major) to consist of three troops, each consisting of 3 platoons organized as provided in the C. S. R. The regiment to consist of three squadrons, a band, a machine gun troop and a headquarters troop. The brigade to consist of three regiments supplemented, when acting alone, by a battery of artillery. The division to consist of two or more brigades and auxiliary troops (Par. 534, C. S. R.) The machine gun troop will have six instead of two guns, while the headquarters troop will include 12 motor cyclists, a demolition squad (8 men) and 36 specially trained scouts. The organization of five additional regiments is contemplated. The regiment as thus organized will consist of 47 officers and 1070 enlisted men. An additional 1st lieutenant recommended for each of the nine troops composing the squadrons would increase the regimental officers to 56. The resulting organization provides for 940 (or 1120) total commissioned and 21,400 total enlisted, as compared with 760 commissioned and 12,780 enlisted under existing organization.

—Scouting

[Some lessons for the Subalterns of my Squadron. Scouting. By E. de Oliveira Figueiredo. *Boletim Mensal*, Feb, '15. 3000 words. Sketch.]

Discusses the use of cavalry, independent cavalry, divisional cavalry. Scouting by the independent cavalry and by the divisional cavalry; use of field telegraph and wireless; orders of the cavalry commander; posts of communication; each patrol leader must economize his messengers, as far as possible. Precautions in hostile country. Combat patrols—their duties.

Supporting squadrons for the cavalry patrols. Orders of the squadron commanders—what they must contain, and in what form. Mission of supporting squadrons: to brush aside hostile cavalry patrols and insure the progress of our cavalry patrols. They serve also as centers of communication between the patrols and the main body of the cavalry.

[Instruction of Scouts. By Lieut. R. Aristóbulo de Vera, Argentine Army. *Rev. Militar* (Argentine). June, '15. 3500 words.]

(This article treats, in great part, of the duti·s of cavalry in campaign, following strictly accepted ideas of this service in modern armies.)

The service of security and information is carried out mainly by small groups (patrols), and its success depends in great measure on the skill of the individual scouts. Men selected for special training as scouts should be good horsemen, shrewd and daring, and possessing keen sight and hearing. The instruction should be methodical and progressive and should include both theoretical and practical work.

Theoretical instruction should include methods of orientation, knowledge and employment of the terrain, and the development of a military vocabulary and form of expression.

Sessions in the study room should be alternated with exercises in the open in which the men are required to apply the different means of orientation and to make verbal report of the surrounding country, condition and character of roads, etc.

—Service Regulations

See also
CAVALRY—DRILL REGULATIONS

United States

[Cavalry Service Regulations. By Capt. H. R. Hickok, 15th Cav. *Jour. U. S. Cav. Assn.* Apr., '15. 1800 words.]

The provisional Cav. Ser. Reg. (1914) are believed to have resulted from the efforts of a small but influential minority of the cavalry, who have been constantly agitating since 1910 the view that the mounted charge is the "main rôle of the cavalry arm." They have proven satisfactory neither as Drill Regulations nor as a Manual of Cavalry. In the entirely new start that is apt to be necessary in the near future in the matter of fixing a plan of organization and training for cavalry, certain basic principles should be observed, among them being:

A present-in-ranks troop strength of about 100 men; a regimental organization composed of 3 squadrons of 4 troops each; provision for single rank formation in place of double rank.

Either "a drill book, pure and simple, or else a Manual of Cavalry covering the entire field of cavalry instruction" should be provided.

The machine gun unit should have a suitable legal organization in lieu of the present makeshift one, and should be armed with a reliable gun. The various headquarter detachments, orderlies, etc., should similarly be legally provided for and no longer operate as a drain upon the troops. The maintenance of personnel and remounts in war must be provided for.

[Cavalry Service Regulations. By Lieut-Col. De R. C. Cabell, 10th Cav. *Army & Navy Jour.*, June 19, '15. 1500 words.]

The ideal cavalry is that developed by the Civil War—mobile and able to fight equally well mounted or dismounted. It is for this sort of cavalry that we need Drill Regulations.

The objects of drill are (1) discipline and (2) to change rapidly from one formation to another, and of these the first is the more important. To inculcate discipline, drill should be precise, and no initiative allowed. The place for initiative is in the application of drill to conditions in the field and in battle. The second object is accomplished by formations suited to the weapons with which we are armed, and when the methods of changing from one formation to another give the greatest flexibility.

In the formation and in the methods of changing from one formation to another, the

CAVALRY—Continued

Cavalry Service Regulations are inferior to the Cavalry Drill Regulations. The double rank is more vulnerable to fire, and suited only to the smoothest terrain.

The drill in the Cavalry Service Regulations is based upon the double rank, which is claimed to permit easy handling of more men by a commander, to permit assembling more men in a given space, and to give more suitable formations for the mounted charge. The first two claims are believed to be erroneous, as equal results can be secured with the Cavalry Drill Regulations. The third claim is a subject of honest difference of opinion. If the front rank be armed with the lance and the rear rank with the saber, the double rank is possibly better. But with both ranks armed with the saber and pistol, the single rank is better. Smashing power can be better gained by successive single than by double ranks, the long line resulting from single rank favors striking the opponent's flanks.

The chapter in the Cavalry Service Regulations devoted to campaign should be more in detail, as it covers an important part of the year's work.

Organization has little to do with *mobility*. The legal organization of our regiments gives greater *flexibility*.

Two years of experience has not produced an agreement among our officers concerning the relative merits of the old and new regulations. There is a disposition to combine the best points of both in another Drill Regulations.

Those officers favoring the Cavalry Service Regulations do so because they want a larger command at drill, or because the use of signals gives a smooth, quiet drill. The first of these objects can be accomplished by combining two troops at drill, unless larger troops can be secured, and the second object can be secured by using signals with the old drill.

The bad points in the Cavalry Service Regulations are:

(a) It is based upon the mounted charge as the main use of cavalry; (b) it is based upon the habitual use of the double rank; (c) the organization of the regiment is poor; (d) the drill proper is designedly loose; (e) there is no detailed instruction in field training; (f) its habitual formations of column of platoons and of line in double rank, are the most vulnerable formations, the least flexible, and not adapted to dismounted work; (g) its ceremonies are loose, and space is apparently gained by slurring over the details of ceremonies.

The best solution is a new Drill Regulations based upon our present legal organization and making liberal use of these parts of the Cavalry Service Regulations which have been proved good. These parts are the School of the Trooper, mounted, the chapter on Campaign, and the use of signals. This new Drill Regulations should be written by a board small in numbers, or by one man.

[Cavalry Service Regulations. By Maj. C. D. Rhodes, Cavalry. *Army & Navy Jour.*, June 12, '15. 2100 words.]

All cavalry officers are required to submit a report to the War Department in June on the Cavalry Service Regulations. Discussion is of interest because of the increasing probability of army reorganization and the fragmentary character of reports on cavalry operations in Europe.

While the adoption of permanent regulations should await information concerning operations in the present war, some facts indicating the *trend* of the limitation of cavalry instruction have filtered through, as follows:

(a) The initial work of cavalry in a great conflict is so arduous and horse-killing that every ounce of extra weight must be taken from the horse. Both the French and the German cavalry apparently crippled their usefulness early in the game.

(b) Night marches of cavalry will be especially necessary and frequent.

(c) The habitual advance of cavalry, not in the immediate presence of the enemy, has, as in this country, been in column of twos or fours, and not by platoons.

(d) Mounted shock action by cavalry will almost never be possible against infantry or field artillery. Against enemy cavalry it will be infrequent, except in the first clash of opposing armies, or in subsequent detached operations of cavalry against cavalry.

(e) British reports indicate a disposition to retain the saber, but to eliminate the "cuts," retaining the "points." German reports show a tendency to confine the trooper's arms to rifle, bayonet and intrenching tool; the added weight of the saber to the horse not being worth the very infrequent opportunity of using it.

(f) The use of motorcycles and motor transport by cavalry has increased its mobility and has become indispensable where roads permit of their use.

(g) While increasing the vulnerability of cavalry to artillery or machine gun attack, the use of aeroplanes by both sides has increased the possibilities of the "surprise attack" by cavalry against cavalry. Each cavalry division or separate cavalry brigade must have its own air craft.

(h) The use of large cavalry units as a *mobile dismounted reserve* will be very important and common in future campaigns to replace or strengthen beaten or hard-pressed infantry, either in the open or in trenches; in the main firing line or on the flanks.

(i) In the British experience at least the use of the double rank by cavalry has not been found disadvantageous, and will not be discontinued as a result of the war. It has been found advantageous for the very occasional *shock action*, as previous experience has always proven; and advantageous in maneuvring cavalry for *dismounted* fire action, because of the *compactness* of the formation for approaching the rear of a position under cover, and because of the *elasticity* of promptly changing to single rank or extended formations when coming under fire.

(j) The importance of dismounted fire action of cavalry has been immensely enhanced by modern war conditions: but the nervous

and muscular strain on both horse and rider is so great that both must be trained to the highest degree of skilled mobility to be of permanent value.

The tactical use of cavalry in the Civil War was in the right direction. Poinsett's double rank, two squadron regulations, were in use. The single rank formation was introduced by Upton's Cavalry Tactics (1873), on which the Cavalry Drill Regulations were based, and represented a conscientious effort to assimilate Upton's Infantry Tactics to the cavalry arm. Gens. Cooke and Wheeler advocated single rank formation, but Gens. Sheridan and Wilson used double rank, as in the Cavalry Service Regulations.

The author's own experience at Winchester and elsewhere indicates the following exceptions to the Cavalry Service Regulations, which are otherwise the proper drill for war. Signals should not be used by higher than squadron commanders; squadron and platoon commanders must be free to leave their normal positions when necessary; column of twos and fours should preferably be used for advance; and the regimental commander should command the squadrons (troops) *through* his majors.

Considering the objections raised to the Cavalry Service Regulations, it is believed that cavalry will be used in masses, if not for shock action, at least for concentration, maneuvring, and fire action; that double rank gives easier control, facilitates replacing losses, and a single rank may be formed when seriously depleted; that double rank is a good formation from which to fight on foot; that from double rank cavalry can form column of squads easily; that horses should not be kept habitually in the rear rank, when all will be trained alike; that in double rank, the rear rank will fill the gaps in the front rank; that the ensuing *mêlée* can be more readily reorganized than two single ranks; that it is recognized by all that a double rank charge has more impetus; that a double rank charge is supported by another line in double rank, subject to control as in single rank; that the double rank formation can be readily moved to a flank by command Fours Right (Par. 335, C. S. R.); that the rally can be used in any direction as an emergency measure; that the experience at the Winchester Camp proved the elastic mobility of the Cavalry Service Regulations for deploying in any direction with the least loss of time; that the six squadron regiment is a wise mean between the small four-squadron regiment and our legal twelve-troop dismounted action regiment; that it appears, however, in view of the increased importance of dismounted fire action, unwise to reduce the number of rifles in a regiment to increase mobility for very occasional shock action, and a three- or four-troop squadron is susceptible of the same uses as a four-squadron or six-squadron European regiment. Drill in single rank is claimed to be simpler. This is an important point, considering our use of volunteer cavalry. However, it was commented at the Winchester Camp that remarkable progress was made in the double rank drill, due probably in part to the snap and action appealing to the imagination of the average trooper.

Consideration is invited to either one of the following organizations for our cavalry regiment:

(a) Apply the Cavalry Service Regulations to our present three-squadron, twelve-troop regiment; each troop to be kept *at war strength,* and to be formed in double rank with three platoons of four squads each.

(b) Apply the Cavalry Service Regulations to a three-squadron, nine-troop regiment, each troop to be kept *at war strength,* and to be formed in double rank with three or four platoons, of four squads each; the additional troops, to consist of one machine-gun troop, one headquarters troop (including band, scouts, motorcyclists and demolition squad), and one pack train.

While extreme mobility is now and will be one of the most important qualities of *good* cavalry, mounted combat can no longer be considered its *main* rôle, except in operating against hostile cavalry.

—Service Regulations—Double vs. Single Rank Formation

[Cavalry Drill and Organization. By Lieut.-Col. Farrand Sayre, 7th Cavalry. *Army & Navy Jour.* May 8 and 15, 1915. 5000 words.]

The proposed changes in cavalry drill and organization have already been thoroughly discussed, but full and free discussion at the present time is vitally important.

It matters little how cavalry movements are accomplished. The important question is as to the changes in organization and the double rank formation, introduced by the Cavalry Service Regulations, 1914. These changes concern the chief use of cavalry and the whole subject of training, and are therefore of vital importance.

The Cavalry Service Regulations are based upon a change in organization, and are at variance with the present legal organization. Duties are provided for only two majors, whereas there are three. Our cavalry is differently armed from that of European countries, and this difference must be recognized.

Our cavalry gained its present organization during the Civil War. Poinsett's Tactics, using double rank formation, was in use at the beginning. In 1862, Cooke's Tactics, based on single rank formation, was adopted for the Federal Cavalry. Wheeler's Tactics, based on a similar formation, was adopted for the Confederate Cavalry in 1863. The authors of both these Tactics considered the change to single rank formation important, simplifying and facilitating movement.

Gen. Cooke rewrote his Tactics after the Civil War and adhered to the single rank formation. This received General Merritt's approval. Gen. Upton, who had observed the working of both the single and double rank formations adopted the single rank.

Our cavalry is not likely to be employed in mass. For delaying actions, screening, and reconnaissance, our present legal organization is ideal. In Europe, economy is an important consideration, while with our small force, the problem is to make our cavalry cover as much

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ground as possible. Our experience calls for a unit organization of 100 men, with plenty of officers. The men must do their own horse training.

The constant trend has been toward a decreasing depth of formation. Infantry maneuvers in double rank for convenience. The same considerations require single rank in cavalry. Infantry and dismounted cavalry fight in a single line formation.

In the double rank formation, the rear rank replaces the casualties in the front rank, but otherwise adds little to the impetus of the charge. Depth is essential, but it can be gained by two single ranks, with less liability to disorder, because the second rank is under separate control. In the double rank charge, the rear rank may in the shock merely collide with the front rank with more damage to friend than foe. A second single rank will arrive in order and may be effectually used in the mélee.

Drill in single rank is simpler and requires less time to learn.

Aside from suitability as a charging formation, the following advantages are claimed for the double rank formation:—

(a) *The drill has great mobility. Mobility* is dependent upon the speed and condition of horses, shoes, packs, etc., but *flexibility* is greater in single rank. The double rank introduces a rigidity which hampers lateral movements, deployment to a flank, and movement to the rear.

(b) *Use of signals,* but signals can be and have been used as well with the single rank formation.

(c) *Leadership.* This exists under the Cavalry Drill Regulations, and the commander becomes guide in gait and direction by giving the command "Follow in Trace." He was always the guide in charging and rallying. In the Cavalry Service Regulatioins, the commander is normally the guide, and may cease to be so by indicating the gait and direction. The difference is nominal. Under either the commander can be guide or not as he chooses.

(d) *Fan shaped deployments.* These may be used by single rank formation as readily as by double rank. Their importance has been exaggerated. They have their limitations, as the commander does not know exactly where his flanks will rest. They apply to deployments to the front from column which has the disadvantage of holding the leading unit at a walk or trot. Deployments are ordinarily made to the flank when practicable, and in this deployment the single rank is superior.

(e) *That it shortens columns and facilitates the handling of Cavalry masses.* The column of platoons in double rank is shorter, but it cannot be used as a marching formation in the U. S. There seems no reason for adopting a formation suitable only for operations in Germany and France. The length of a column can be shortened on wide roads by marching in column of eights. Distances and intervals may be reduced to zero if desired.

Balck (Taktik, Vol. II) criticises six squadron regiments as offering temptation to make detachments, as being unwieldly, and as necessitating an intermediate unit. He speaks of the mobility of three squadron regiments, but says they are too weak. European squadrons are, however, smaller than American. Lord Wellington and Prince Frederick Charles are quoted by Balck as favoring the single rank formation on account of mobility, though difficult to handle and easily pierced. Conservatism and economy have prevented the use of single rank formation in Europe. It has been thoroughly tested in America and it is believed that the objections are not serious, while the advantages are real and important.

[Single Rank for Cavalry. By Col. J. T. Dickman, 2d Cav. *Army & Navy Jour.,* July 3, '15. 600 words.]

The first U. S. Cavalry Tactics based on single rank formation was approved by the President and promulgated by the War Department Nov 1, 1861. Difficulties arose in the application of the new Cavalry Tactics in time of actual war. A specific trial of the new Tactics with the 4th Pennsylvania Cavalry showed that it could be easily mastered and executed, but the old drill was continued in use by common consent.

In the Western armies there was some confusion and Gen. James H. Wilson issued an order toward the end of 1864 prescribing the habitual use of double rank. He complained after a review in Feb 1865 of the enormous extension of single rank, a difficulty that might have been avoided by using several lines, or lines of columns or masses.

After the war, a board of four able officers prepared a report and submitted a new U. S. Cavalry Tactics. Its report was approved and the new U. S. Cavalry Tactics distributed in 1874.

It has been claimed that the single rank for cavalry came from an effort to assimilate the cavalry tactics to that of infantry. But single rank was already the adopted formation for cavalry both mounted and dismounted. Instead of passing from double to single rank, the board showed a distinct tendency to return to double rank. The complete elimination of double rank,—also the work of officers with Civil War experience,—came later, and now there is only a trace of it left. (Par 663, C. D. R. 1911)

Our present organization and single rank formation have many practical advantages, as experience in handling a regiment on narrow roads and streets and in maneuvers in difficult country proves.

These advantages should not be permitted to be outweighed by the improvements of the Cavalry Service Regulations, which are independent of organization and number of ranks.

[Single or Double Rank. Extract from report of Lieut. D. L. Roscoe, 1st U. S. Cav. *Army & Navy Jour.,* July 10, '15. 900 words.]

The new Cavalry Service Regulations contain many things of value,—greater freedom to subordinates, leading by unit commanders,

better methods of transmitting commands, and subordination of method to result at drill. But all these can be gained with equal facility and better advantage with the single rank formation.

Methods in the Cavalry Service Regulations are based on the assumption that "Mounted action is the main rôle of cavalry." But mounted combat will be the exception and not the rule, and organization, armament and instruction should be based on the methods of combat peculiar to American cavalry.

As to double *vs.* single rank formation, two single ranks charging each other would have equal chance, as would two double ranks. If double and single rank charged each other, the advantage would perhaps be with the double rank, but this would be more than counterbalanced by the subsequent arrival of another single rank.

In all movements in double rank, the rear rank is at a disadvantage because irregularities of the ground are concealed from the rear rank and this fact leads to mishaps. As an instance, in taking a ditch in double rank, nearly all of the front rank cleared it and nearly all of the rear rank fell into it.

The saber is not considered a suitable arm for the cavalry, as our men are better fitted to use a cutting weapon. A short, sharp, heavy bladed weapon resembling a Moro borong is advocated.

[Cavalry Drill and Organization. By Lieut. Colonel Farrand Sayre, 7th Cavalry, *Jour. U. S. Cav. Assn.*, July, '15. 4500 words.]

Some prejudice has undoubtedly existed against the drill contained in the Cavalry Service Regulations, 1914, because it is believed to be of foreign origin, and in favor of the drill in the Cavalry Drill Regulations, because the latter is believed to be of American origin and the outgrowth of our experience in the Civil War. If, by means of the new drill, our cavalry is rendered more efficient, we should favor its adoption and not be affécted by other considerations. It has been alleged that the force of inertia has operated against the new drill but without much foundation, as the cavalry has taken hold and learned the new drill and is disposed to give it a fair trial.

The adoption of the Cavalry Service Regulations, 1914, will at once bring up the question of the necessity of legislation to change our organization to make it conform to the drill. Consequently, the change of drill cannot be considered apart from the change of organization.

A historical glance shows that Poinsett's Tactics, involving the double rank, was used by a considerable portion of the Union Cavalry in the Civil War. Cooke's Tactics for the Union Cavalry (1862) and Wheeler's for the Confederate (1863) were based on single rank formations. Forrest and Morgan used single rank from the beginning of the war. All of the cavalry in the Western army used single rank during Wilson's Selma raid. Upton's "Tactics" was written after his war experience both with the Eastern armies where double rank was used and with Western armies where single rank was used; he adopted single rank.

In view of the weakness of our army in cavalry and the fact that cavalry cannot be expanded readily in war, it is not likely that our cavalry will be employed in masses. Our present legal organization is ideal for the delaying actions, screening and reconnaissance which will form a great part of the cavalry's work and in which a great deal of responsibility will be thrown on the commanders of small groups. With us the problem will be to make a small number of men cover as much ground as possible.

Our experience shows that 100 men are about all that can be grouped into a troop, as our men are not so readily controlled as Europeans and need more officers. The strength of our units fluctuates greatly, and an elastic organization is necessary. The evolution of formations shows a decrease in depth: changing from single to double rank would be retrogression rather than progress.

Cavalry in double rank cannot wheel from line into column of fours. The column of platoons (squadron column, C. S. R., 1914), the normal march column in France, is impracticable here, and we have to march in fours or even twos.

Habitual marching in the rear rank does not give the training that a cavalry soldier should have. A tendency in the rear rank to drop back has been noticed in the charge, thus defeating the cohesive principle that is supposed to give more power to the shock. By forming the same number of men in single ranks, greater depth can be given, and the victory goes to the side that brings up the last formed reserve. The broader front of the same number of men in single rank tends to protect our flanks and to jeopardize those of the enemy.

The advantages of the double rank are claimed to be:

(a) The drill has great mobility.

This is open to discussion. The facts that wheels by fours cannot be made without loss of formation, that the right of each platoon must always be on the right or in front, introduce an element of rigidity into the double rank drill. C. S. R. says: "The line of platoon columns (or the line of squadron masses) favors deployment to the front . . . however, it is not favorable to a deployment to a flank." Similar formations in single rank may be deployed readily to a flank. Despite the fact that a line in double rank is easier to lead, the maximum of fighting efficiency is to be expected from the line in single rank, because every man can be brought into contact with the enemy.

(b) Use of signals.

Signals can be as easily used in single rank drill.

(c) Leadership.

Existed in the old "Follow in trace." It could be made normal instead of exceptional without changing our formation and organization.

(d) Fan-shaped deployments.

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Their importance has been greatly exaggerated. They cannot be used when the exact location of a flank is important. The commander will ordinarily prefer to direct the march of his column so as to bring it upon the ground he wishes to occupy and then form line to a flank.

(e) That it shortens columns and facilitates the handling of cavalry masses.

The column of platoons does not possess for us the importance that it has in Europe. The length of columns depends on the number of men that can march abreast and this depends on the road. When it is desired to assemble a large number of men in a small space, the "masses," "column of masses" and "line of masses" provided for by the old drill afford as dense formations as those of the C. S. R.

Conservatism and considerations of economy have prevented the single rank formation of cavalry from being tested to any considerable extent in Europe; it has, however, been thoroughly tested on the American continent, and the objections which Balck mentions that "it is difficult to handle" and that "it breaks easily during movements" have been found to be groundless. There seems to be no good reason for thinking that it is "easily pierced"; the utility of the men who fill gaps occasioned by losses does not justify the existence of the entire second rank. He says that "the single rank is claimed to have greater mobility, it facilitates movements and assembling after a charge, and suffers less from fire"; very real and important advantages, it seems to us.

—Special duties

[Special Tasks of Cavalry in War. By Lieut.-Col. Richard Ungermann, Austro-Hungarian Army. *Mitteilungen über Gegenstände des Artillerie und Geniewesens.* Feb 1915. 4000 words, 1 sketch map.]

Special tasks that may exert a potent influence on the larger operations will fall to the lot of cavalry in war.

In the Turko-Russian war of 1877-78, three Russian armies moved into Rumania, the right column being accompanied by the 8th Cavalry Division, which was to cover the left bank of the Danube from Corabia to Giurgevo. The failure of the Turks to seize all means of crossing the Danube, which they had decided to defend, resulted in serious consequences for their army. On May 7th, the Russian cavalry seized the Greek steamer *Anneta* and two iron barges, whose value was obvious in view of the difficult task confronting the Russians, that of crossing a river 1000 m. wide, with swampy approaches, and defended by numerous forts and a flotilla of 46 vessels. The task of guarding the captured vessels was difficult, as they were bombarded by Turkish monitors and by the fortress Nicopolis. An attempt to remove them to the mouth of the Oltu was frustrated by a Turkish monitor, which sank the barges and damaged the *Anneta*. The Russians now partially submerged the *Anneta* to prevent further damage. Presumably her forward and stern compartments were filled, her engine room remaining dry.

The Russians succeeded in closing the Danube effectively with mines at Flamanda, and began crossing at Zimnica on June 15th. The 14th Infantry Division, which crossed first, was hard pressed by the enemy until the *Anneta*, which had meantime been raised, brought reinforcements. By evening, 29 battalions, 30 guns, and some Cossacks were across. Bridge construction was now begun. When a gale several days later demolished the almost completed first bridge, the scattered parts thereof were quickly brought back by the *Anneta*, and the damage repaired.

The vessels captured by the cavalry at Corabia could not be utilized at Zimnica, as they could not pass the fortress of Nicopolis.

Kuropatkin admits that the Russian cavalry was not equal to its task in the Russo-Japanese war. If Mistchenko's cavalry had removed or destroyed all lumber and junks on the enemy's side of the Yalu, when it retired over that river on April 2d, the Japanese would not have been able to prepare 1155 m. of reserve bridge matériel at Jenampo, nor to transport bridge matériel on junks to Widshu. The Japanese crossed the Yalu at Widshu on May 1, their 12th Division crossing a few miles higher up, the night before. It would have been easy for the Russian cavalry posted above Widshu to damage the Japanese bridges by floating logs, rafts, etc., against them, but nothing was done. As the Japanese ponton equipment was heavy and the upper bridge had no reserve matériel, any damage done would have produced a far reaching effect.

Such work does not require special technical knowledge, and any cavalry unit should be able to undertake it. Where logs are not available, beams from houses, railroad ties, etc., can be used. Junks loaded with rocks might have been employed at the Yalu, for example. If a defeated enemy retires across a river, the pursuing cavalry should seize every raft, row, motor, or steamboat, even mills, and timber yards, etc., for possible subsequent use. In a retreat across a river, the cavalry should seize and destroy or bring to the farther bank all means that might enable the enemy to cross in pursuit.

—Supply and Transport for

[Transportation for a Cavalry Regiment. By Col. W. C. Brown, 10th Cav'y. *Jour. U. S. Cavalry Assn.*, Oct. '15. 1200 words. With tables showing present and proposed distribution of wagons, etc.]

The distribution of the baggage of a cavalry regiment on its baggage section, as indicated by the Tables of Organization and recent War Dept. orders seems so unsuited to satisfactory application in active operations that a substitute has been sought which, while retaining the advantages incident to the present scheme, yet gives each troop a wagon of its own. The present plan, apparently the result of an effort to fit to a regiment of cavalry the scheme adopted for a regiment of infantry, ignores the fact that, in active operations, infantry regiments will probably remain intact while the reverse will usually obtain with the cavalry; witness, present conditions on the Mexican border and the ex-

perience of the cavalry for the past fifty years. Taking, however, the extreme favorable case when a cavalry regiment is intact and no troop sends to the baggage wagons more than its exact proportionate share of baggage (6-14 of a wagon load), the inconvenience incident to carrying baggage over the long distances covering the front of a cavalry bivouac are unavoidable, and will present themselves again when loads are to be delivered at the end of the day's march. All baggage will have to be tagged or marked and even then mixing will occur. The first wagon can carry the entire baggage of two troops (6-14x2); but the third troop must divide its load between two wagons. A better allotment would be to give each troop one wagon to carry the troop's baggage and its rations for a certain number of days, combat wagons to remain one per squadron, as at present. There will then remain eight wagons available for rations or grain or both or for general purposes. These could be attached, two to each squadron and two to the Hdqrs. Troop and Machine Gun Troop or all be left in one train under the Quartermaster. The total number of wagons in the field and combat trains of the regiment will be the same as now provided—namely, 25. Should the incidents of service require a temporary cut in the number of available wagons, this can be so done [method is given in detail in article] as to avoid any such inconvenient proportionate allowance as now exists—6-14 of a wagon per troop. Under the present arrangment, "We adopt a scheme at the outset which makes the regiment uncomfortable *all* the time, whereas by a different arrangement we might make them comfortable *most* of the time." A less inconvenient arrangement than the present one would be to give at the outset a wagon to each two troops, two fourteenths of the space on each wagon to be used for rations and grain, the ration section to consist of 15 wagons instead of 16 as now provided.

—Tactics—Divisional troops

[Divisional Cavalry on the March and in Action. By Col. J. A. Gaston, 6th Cav. *Jour. U. S. Cav. Assn.* Apr '15. 2500 words.]

Modern inventions, such as aeroplanes, Zeppelins, armored motor cars, radio communication, etc., have made changes in certain details of military operations, but have not done away with the necessity for cavalry nor altered the general principles governing its use. Divisional cavalry will ordinarily consist of the cavalry regiment assigned to the division. It may, however, be increased for special purposes; and, when divisions are united to form field armies, some of the cavalry with them may be brigaded and only small units be left to act as divisional cavalry. The commander of a division operating alone may send his cavalry ahead as "independent cavalry," may use it as "advance cavalry" with his advance guard, or employ it, in whole or in part, on similar duties on his flank or rear, or on some special mission. The best guide (other than actual service) for learning the appropriate uses of cavalry is the detailed study of cavalry history with a view to analyzing the causes of success and failure in the past. For our purposes the "Records of the War of the Rebellion" furnish valuable lessons. Due to the expense and time incident to its training, cavalry should not as a rule be used for any work that can be equally well performed by some other branch. At the foundations of its proper use lie the details of care and training of the individual man and horse. Quickness of decision is peculiarly essential. Care of flanks, proper reconnaissance of ground preceding mounted action, withdrawal in sufficient time in retreat, maintenance of a suitable natural gait on the march, are points to be borne in mind. Reconnaissance by flank patrols in difficult country can usually best be accomplished by sending out successive patrols, to cover some road or other feature and then rejoin, rather than by attempting parallel march by patrols across country. The larger part of cavalry work consists in reconnaissance and screening and much of its combat work will be dismounted. Its most striking tactical successes are apt to follow upon a skilfully executed and well timed charge, while parallel pursuit of an enemy offers special opportunities for decisive results—e.g., in Sheridan's operations culminating in Lee's surrender. Points to be kept in mind are: the relation between strength and mission, the probable opposition being duly considered; the employment of the machine gun units; the use of demolition outfits; the proper combination of mounted and dismounted action; the effect of obstacles; mobility of horses during dismounted work; care of horses when men temporarily occupy trenches; use on convoys; and use in connection with horse artillery.

—Tactics—In Frontier Warfare

[Some Experiences of Indian Cavalry in Frontier Warfare. By Lieut. Col. G. M. Baldwin, D.S.C., 25th Cavalry, F.F. *Jour. United Service Inst. India,* Apr., '15. 4000 words. 1 sketch map.]

The operations on the northwest frontier in 1895 and 1897, in which the Guides Cavalry participated, demonstrated that when cavalry is pursuing a panic stricken foe who makes very little resistance, it matters little whether cutting or pointing is employed as the means of inflicting casualties. But a charge made by a half squadron early in 1895, demonstrated the value of pointing over cutting. Against a resolute enemy on foot who is prepared to turn on his mounted adversary, the point is by far the most effective way to use the sword. By the same token, a lance, which has a still longer reach than a sword, is the most effective weapon in a charge and the moral effect it produces is also undoubtedly greater.

Two or more extended lines at 150 to 200 yards distance are considered best for charging tribesmen. This formation would enable each trooper to single out his opponent more easily, and the moral support of the rear line would be very perplexing if not terrifying to flying tribesmen. The cavalry suffered severely in actions where the ground was difficult.

On one occasion, little groups of 6 to 7 men were dismounted and replied to the enemy's

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fire. Other little groups of mounted men remained in hollows or behind obstacles. Whenever the enemy tried to rush one of the dismounted parties, these mounted groups advanced and chased them back to cover.

Shoeing requires much attention. An extra nail is absolutely necessary. It is advisable to inspect all shoes after crossing boulder streams as it is marvelous how many shoes are cast during such a crossing.

Cavalry operations by night would seem to be rarely practicable. Moving cavalry by night is far more difficult than is the case with infantry, and involves correspondingly greater risk.

—Use of in Balkan Wars

[Turkish Cavalry during the Turko-Bulgarian War. By Lieut. Djemil Munir Bey, Turkish Army. Trans. from the French by Col. C. H. Hunter and Lieut. H. J. Adair, U. S. A. *Jour. U. S. Cav. Assn.*, July '15 15,000 words.]

(Extract from introduction by General Bonnal, French Army.)

During the recent war in the Balkans, the only Turkish division of cavalry operated in Thrace. The author, after taking the course at St. Cyr, served a period with the 27th Dragoons at Versailles, then another with the Prussian Hussars at Danzig. During the campaign Djemil Munir Bey had such a brilliant career that he was recommended to be promoted to the grade of captain and for the Military Gold Medal for Merit.

The operations of the Turkish cavalry in Thrace have been very successful and, as they are the actual testing of the principles of the French cavalry, they do honor to the young Turkish officer of French military training, who in them has filled positions far above his grade.

(General Bonnal also says that General Salih Pacha got Djemil Munir Bey from the General Staff at the beginning of the war, to use him for his chief of staff. In his own narrative, this Turkish officer gives himself as one of the three aids to the Chief of Staff.)

Two days before the commencement of hostilities, Wednesday, Oct 16th, the division having received from the commander-in-chief the news that the war was imminent, Salih Pacha, commanding the cavalry division (3 brigades of 2 regiments each, 2 batteries of horse artillery, machine-gun troops, a detachment of engineers, and a telegraph section) decided to approach the Bulgarian border from the concentration camp at Sulu-Oghlou, west of Kirk-Kilisseh. During this time, the main body of the army was assembling south of the line Adrianople—Kirk-Kilisseh.

Owing to faulty communications, the cavalry division commander was not notified at once of the declaration of war, and the Bulgars had crossed the border and driven his leading brigade before it was realized that war was really on. He decided to send forward 3 brigades in frontal attack against the enemy advancing from Hadjilar and Waysal upon Hadji-Danishmend, while the reserve brigade (recently joined from Adrianople) should take him in flank. As the Bulgarian column was descending the Hadjilar hill, we could see and count the troops—one division of about 20,000 men. Our three batteries waited to open fire until the enemy should have reached the bottom of the valley. The distance was from 6000 to 6500 meters. The artillery succeeded in stopping the enemy, and 5 regiments of dismounted cavalry engaged him. A brigade of hostile cavalry coming up refused battle when Salih Pacha's reserve brigade moved out to meet it. When the Bulgarian infantry was deployed and their artillery had gone into action, the Turkish division withdrew to Sulu-Oghlou. Contact was maintained, but the Bulgarians became very cautious. Though the cavalry division was ready to resist until the arrival of infantry in its support, it was not attacked.

During the first advance of the Bulgars, there were few or no reconnaissance patrols on their front and flanks. The Bulgars rely on their peasants, who hate the Turks, for information about our movements. This information they received, but it must have been exaggerated as to numbers, for they advanced with much prudence. The Turks have estimated our forces at Kirk-Kilisseh as 160,000 men, whereas, in reality, there were only from 65,000 to 75,000.

The Bulgarian service of security on the march was thus organized. In front there was a thin line of infantry sharpshooters or skirmishers (a platoon to a company occupying a front of about 1000 meters), some 500 meters behind these skirmishers, a cavalry point of from 6 to 8 men, then a whole platoon. Afterward, there came a battalion and, behind them, with proper intervals, the rest of the advance guard. As soon as the advance guard was fired on, all the infantry lay down, while the cavalry disappeared, not to reappear. This seemed to me and to other officers an inexplicable arrangement.

On the night of Oct. 21-22d, the cavalry division received an order to proceed to the extreme left, to cooperate in a general attack by Abdullah Pacha's army (Battle of Sulu-Oghlou—Getchkenlin or Kirk-Kilisseh). The offensive degenerated into a real series of casual encounters, the divisional cavalry not having been, so they said, on to its job. In this connection, it must be said that it is the usual thing to unload all mistakes upon the cavalry. So, at maneuvers, the side that has been beaten always begins by saying that its cavalry had not brought in the proper information.

The 3rd, 1st and 4th Corps were, however, all in action about two o'clock in the afternoon. The cavalry was to the northeast of Hadji Eumer and was enfilading the whole line opposite to the Ismid division (4th Corps). Why the detachment of the enemy at Ortakdji did not attack, I do not know. If it had, our position and that of the 4th Corps would have been critical. The cavalry divisions' well-protected batteries did wonders

against the Bulgarian reserves. At nightfall, our reserves charged with the bayonet and put the enemy to flight. At this moment, we were the conquerors, in spite of the absence from the battlefield of the 2nd Corps, of the 12th Division, and of all the artillery of the 4th Corps.

But then the rain, implacable enemy of the Turks, and whose effect on poorly disciplined troops is greater than that of shrapnel, began to fall with the greatest violence.

About half-past eight, while the rain was raging, heavy firing that lasted about 30 minutes broke out in front of the reserve division. To this fusillade, there succeeded a general rout. The senseless flight of these men, whose features betrayed their terror, was a spectacle to break the heart of an officer. The cause of the panic? One battalion of the Ismid division, seeing something moving in front of it, imagined it was the enemy and opened fire on it, and it turned out to be the leading battalion of its own division. As for it, believing the Bulgars were attacking it, it opened a vigorous fire. There were no officers at the heads of these battalions. Such was the origin of the panic resulting from the lack of discipline and cohesion, which had, as a consequence, the loss of Roumelia.

Once informed of the disaster, our cavalry division hurried forward detachments to stop the fugitives. Next morning, we collected and evacuated the wounded and afterwards brought back the cannon that the 4th Corps had abandoned in its panic flight. The excessively heavy terrain explains the terrible losses in artillery suffered by the army corps in retreat. A whole brigade was assigned to each one of the horse artillery batteries. Dismounted men harnessed themselves to the guns, and it was thus that the division accomplished the "tour de force" of abandoning nothing to the enemy.

Before the war, we used to think the cavalry the least efficient of the three arms. During the war, it showed to the best advantage. Why? Because it had from the start the more discipline and was better under the control of its chiefs.

An army that plays politics is a ruined army; that is what happened to ours.

During the retirement on Lule-Burgas, our division acted as a rear-guard for the still disordered fugitives.

At a critical point in the battle of Lule-Burgas, the cavalry was ordered to stop at any cost the forward movement of the enemy. It had to advance exposed to fire but delivered a successful charge and succeeded in driving the enemy to the rear. From then on until nightfall, no enemies were seen on this side.

Matters looked rather favorable for the Turks when another panic took place at night. A whole division of reserves abandoned its position, the Bulgars crowned the breach, and the equilibrium of the whole Turkish line of battle was broken. The general-in-chief having at hand no fresh troops to oppose the enemy, was constrained to order a general retreat. This retreat was covered and our trains were protected by the Cavalry division, now reduced to 600 sabers. It suffered much from hunger.

A delaying action was fought at Tchorlou, in which the skeleton cavalry division caused the deployment of a division of 20,000 men.

It was later incorporated as a regiment in a cavalry brigade that retired, on Nov. 12th, behind the lines of Tchataldja and had nothing more to do. The opposing infantries were in contact, and the wings of the army rested upon two lakes close to the sea.

Principal Causes of the Defeat:

First, numerical superiority of the enemy.

Then meddling of our officers in politics. Under a law called "Revision of Grades," the important generals of the army, such as Mahmoud Moukhta, Hassan Riza, Pertew, Zia Pacha, etc., were "promoted" colonels or lieutenant-colonels. Useless old men took the places of the young, energetic generals. As for the company, squadron and battalion commanders, they were also replaced by "veterans."

Besides, the army was already short of officers and was deprived of many of its company officers, the same politicians having required the dismissal of the officers who had been promoted from the ranks. The scarcity of officers with us was such that, at mobilization, battalions with but three officers were not rare.

Another cause was the failure of the supply system, probably due to the reorganization of the army into corps.

Still another cause was the sending home of soldiers who had completed their time just before the mobilization.

One closing remark: I protest against the assertion that the Turkish soldier is a coward. Like all soldiers in the world, he needs to be commanded.

The officers have redeemed with their blood the errors of peace time. Their losses cannot be less than 40 per cent.

Of the different soldiers, Armenians, Greeks and Jews, admitted by the constitution to the honor of serving, the Armenians alone fought bravely.

The army that ran away at Kirk-Kilisseh, fought heroically for 10 days at Lule-Burgas, less than a week later.

Established behind the famous Tchataldja lines, composed almost entirely of shelter-trenches, this same army, attacked as it was by the cholera, which carried away thousands of men a week, conquered, the 18th of November, 16 days after Lule-Burgas, the Bulgarian army full of enthusiasm, which from the beginning of the campaign had known only victories. That is not the work of cowards.

—Use of in European War

[Heroic Cavalry. Anonymous. *Canadian Military Gazette*, Apr 27, '15. 250 words.]

Sir John French, in an interview, has stated that the Germans might have annihilated the British Expeditionary Force if they had been superior in cavalry. The British cavalry was equal to the task of covering the flanks of the army.

CAVALRY—Continued

[The Cavalry of the Warring Nations. By Maj. Eugenio Massa. *Rivista di Cavalleria,* May, '15. 6000 words.]

The *Russian Cossack* comes from the south and southeastern part of Russia. He is strong, fearless and warlike, but has no initiative. He eats lying down and sleeps out in the open air when possible. He remains for days in the saddle without becoming fatigued, and gallops as rapidly over the mountain roads as over the plains.

The Cossack begins his military career at 18. On enlisting he furnishes his own mount, which is usually a very good one. He is armed with a pistol, saber and dagger, and carbine, or if he comes from the Don or the Urals he has a lance. He serves for three years in the preparatory class, then twelve years in the active or fighting class, five years in the auxiliary class and ten years in the militia. The applicant for enlistment must be between 5 feet 4 and 5 feet 8 inches, and weigh not more than 150 pounds. In time of peace Russia has 137 regiments of Cossacks. The war strength of a Cossack regiment is 37 officers, 933 men and 1070 horses.

The *German Uhlan* regiment is organized into five squadrons and on a war footing has 36 officers, 810 men and 860 horses. A fine class of horse measuring not less than 58.5 inches is furnished by the government farm for them. The Uhlans are armed with a lance and when in ranks they have a Mauser rifle strapped to the backs of their saddles in addition to the lance. For acceptance in one of these regiments the applicant must be between 5 feet 5.7 inches and 5 feet 8.8 inches in height, healthy, and have a well developed chest and an aptitude for horsemanship.

The *French Dragoon* is the bitterest enemy of the German Uhlan. Their systems of tactical instruction differ in that the French advocate the use of the rifle while the Germans advocate the lance. The dragoon is a healthy, strong man, and is used to fatigue. He is intelligent, has great initiative and shoots very accurately. He is armed with a carbine and straight saber. Those in the independent cavalry are armed with a lance. The recruit must be between 5 feet 4.5 inches and 5 feet 8.5 inches in height, not heavy, and must have an aptitude for horsemanship. The mounts are furnished from the government farms and must be between 4 feet 11 inches and 5 feet 4.5 inches and between 4 and 7 years of age.

The *Austro-Hungarian Hussar* is recruited from the different races throughout Austria and Hungary. He is strong, used to fatigue, and very faithful to the aged Emperor. To be accepted for enlistment the recruit must be healthy and be between 5 feet and 5 feet 7 inches. The government farms furnish a fine mount for the Hussar regiments.

The *English* cavalry has thirty-one regiments, three of them being cavalry of the guard stationed in England. In time of peace their regimental organization is in three squadrons and a section of mitrailleuse and has 24 officers, 1 marshal, 55 sergeants, 8 trumpeters, 343 corporals and privates and 280 horses. The war strength is 540 men and 500 horses. The best class of recruits are put into the guard.

The *Indian* troops which form a part of the British cavalry comprise 39 regiments, 14 of which are lancers, 24 light cavalry and 1 regiment of guides (Fuglemen). Several of these regiments are now in France. An Indian regiment has 16 English officers, 17 Indian officers, and 610 Indian privates, with a mitrailleuse section. The native cavalryman is armed with a lance and infantry rifle and the light cavalryman is armed with a long saber and musket. Their mounts are very good.

The *Belgian* cavalry, consisting of two regiments of *Chasseurs,* two regiments of *Guides* (Fuglemen) and four of lancers, accomplished with their infantry a marvelous work in holding back the Germans at the beginning of the present war. The chasseur regiment is composed of five regular squadrons and one depot squadron. Each squadron has 5 officers, 130 men and 130 horses. The men are armed with a carbine and a long lance. The complete Belgian cavalry numbers 350 officers, 8800 men and 9000 horses. Most of the horses have to be imported, a great many coming from Ireland.

Servia has four regiments of cavalry of four squadrons each and one squadron of the guard called the 1st regiment of *Obilizi.* In time of peace the strength of a squadron is 4 officers, 200 men and 180 horses. The men are armed with a Mauser rifle and a long, straight saber. The officers and non-commissioned officers are armed with pistols.

The *Turkish* cavalry consists of 40 regiments of 5 squadrons each. There are 4 officers and 120 men in the squadron. From the warlike tribe of Anatolia they have received 24 regiments of Kurds which they are trying to pattern after the Russian Cossack. The cavalry of the first regiment of each division is armed with the lance while the rest of the cavalry have long double-edged sabers. Every cavalryman has a carbine. The horses raised in Turkey are not very good and many have to be imported.

[Cavalry Lessons from the Great War. By an Officer of High Rank. Berlin, Feb. 1915. *Jour. U. S. Cav. Assn.,* July, '15. 800 words.]

With the coming of aeroplanes, there arose a great whisper in lay and professional circles that the last hour of the cavalry had struck. Our responsible public men, however, urged with special energy a further increase of the cavalry and strove to impress upon our public representatives the fact that cavalry and artillery cannot be improvised in war. We are convinced that this increase has justified itself.

As to reconnaissance, it can be said, in spite of the performance of our self-sacrificing aviator officers, that the cavalry has more than formerly indicated its indispensability.

Throughout, the cases have been rare where cavalry charged infantry. We saw cavalry fight against cavalry, and history will estimate

our mounted forces at their full value. The results of special patrols were notable. Before the great position war in the west began, some keen riding was done. From then on, the dismounted cavalry was employed with good results in the firing-trenches.

The tactical superiority of our cavalry showed itself conspicuously when it was opposed to the Cossacks, who were still living upon their old fame as military centaurs.

With mounted infantry there is nothing to be attained.

The cavalry has not only not become an antiquated arm, but it has, by meeting all conditions of war in such an apt way, dovetailed into the frame of this newest of all wars.

[Cavalry at the Front. By Lieut.-Colonel Freiherr von Welk, German Army, retired. Trans. from the *Jahrbücher für die deutsche Armée und Marine,* Feb, '15. *Jour. U. S. Cav. Assn.,* July, '15. 400 words.]

The value of our cavalry in the first months of the great war and what the lack of performance of the French, Belgian and also the English cavalry cost, is now clear to all. To continue with the operations of the two cavalries, in the extension of the lines to the north in October, we see some contact. Most frequently the opposing cavalry withdrew, especially the French, at every serious contact and left us unhindered in front and flank from pressing forward.

The French flank attempts and also the projected advance on Arras were, according to French reports, failures, due in the main to the persistence of the German mounted troops, who awaited north of Lille the continuance of the great turning fight. Here, on the 10th of October, it came to a real, serious encounter between the two cavalries, in which the French had a full cavalry division, and at Hazebrouck, another division was defeated with heavy loss. Our mounted patrols overran the country, and we may here comment that no mention has been made of the least impropriety against the inhabitants.

The activity of the cavalry became more and more restricted by the terrain, so there developed a position war. By the end of October, it was reported that our dismounted cavalry was working with the spade and fighting with the carbine beside the infantry in the firing-trenches.

One reads that the entire breeding material of the French cavalry, the brood mares, were put into service and thereby domestic horse-breeding completely destroyed.

While we have pointed out that the French cavalry is lacking in enterprise, the same cannot be said of the Russian cavalry in general. They constantly made and renewed the attempt to break through the German and Austro-Hungarian lines and especially to go around the left flank in East Prussia. In this section, the Russian squadrons continued with great persistency their efforts to get a hold on that province.

Great masses of the Russian cavalry were encountered in the beginning of November at Koho, west of Kutno in Poland, where they had crossed the Warta. They were defeated and driven back across the river. Their strength was mentioned as fully 10,000 horses.

Further conflicts took place at Konin on the Warta (Nov. 10th), where our cavalry surprised a Russian battalion and at Koswinek, east of Kalisch (Nov. 11th) where our cavalry drove back a Russian Cavalry Corps. In Galicia, the Russians attempted to push forward with great masses of cavalry but were likewise driven back.

That these conflicts were, without exception, victories for us, in spite of the numerical superiority of the Russian cavalry, we attribute to our known factors of good leading, good training, superior material in men and horses, and our heroic bravery.

[Notes of the European War. By an Officer Abroad. *Jour. U. S. Cav. Assn.,* July, '15. 3000 words.]

Among the things which stand out in my mind to a very marked degree, the first three are: First, the importance of artillery; second, the value of our cavalry; and third, the importance of aeroplanes. Of course, as is always the case, what the men on foot with the rifle have done can be attested by their terrific losses.

The opinion seems to be general that the English cavalry has made good. They have made some brilliant charges when it was necessary, but they have made good by getting off their horses and shooting. The British are quite disappointed with the French cavalry. The English cavalry has been backing the infantry splendidly. I was told of a typical case. The Germans succeeded in breaking through the line at a point. A regiment or brigade of cavalry, my informant was not certain which, came to their support, dismounted and drove the enemy back by fire action. And the English major added: "The French don't understand that work; you can't get them off their horses."

The principal trouble was that they killed their mounts trying to pick a mounted fight and, by the time they had learned their lesson, their big chance to act as cavalry was gone. It would seem that cavalry on the Allies left about Sept 6th could have made it uncomfortable for von Kluck. Later, the French got together some of their cavalry to oppose the German screen during the first part of the extension of the lines to the north about Oct. 1st, but here again mounted action was impracticable on account of the many canals, wire fences, and almost every imaginable obstacle.

They are now in the trenches, for the most part unburdened with horses.

The English cavalry is now armed with the bayonet, and I understand that at least some of the French cavalry were also.

The 75 mm. guns now use nothing but shell.

In the lines as they stand at present, the observation of fire from a point near the battery has been entirely done away with. The fire is observed from aeroplanes or by officers well up near the target. A French battery I saw was using the telephone for communica-

CAVALRY—Continued

tion, but the English are partial to the buzzer.

The ranges have proven much greater than was expected. The average of the 75 mm. has been about 5000 meters, and I have heard that it was fired with success up to 7000 meters. Artillery, during the retreat, sometimes made marches averaging 60 and 70 kilometers.

Batteries are well protected, not from hostile fire but from observation by aeroplanes; with this to be noted, that they had pits for the trails right at the side of each gun for use in firing at planes which might discover them. There is no attempt at cover for the gun crews while they are serving the pieces. If a German aeroplane is sighted, the men remain motionless. If the airman drops a ranging bomb, the personnel runs to cover, waiting for the storm to pass.

—Volunteers

[Organization of a Volunteer Cavalry Regiment,—a Problem. By Capt. W. S. Grant, 3rd Cavalry. *Jour. U. S. Cav. Assn.* July, '15. 4300 words.]

This article assumes that an order has been issued for the organization at Fort Leavenworth, Kansas, of a regiment of volunteer cavalry, of which the colonel, lieutenant colonel, and two majors are officers of the regular army, the other officers having been appointed by the President from the state of Kansas. Further assumptions are: that three months will be allowed the regimental commander for the organization and instruction of his regiment; that 800 men and 800 horses will be supplied by the War Department, these men and horses to arrive on the 14th and 15th days following the receipt of the organization order by the colonel at Fort Leavenworth; that the field officers are present at the latter post when the organization order is received; that the other officers arrive three days later; that the additional men and horses are to be secured by the regimental commander from eastern Kansas; and that the necessary equipment is available in the hands of the post staff officers.

The article then gives a discussion of the steps taken, the methods adopted for the recruitment, organization, equipment, quartering, messing, and instruction of the regiment. Owing to the detailed nature of the discussion, programs of instruction, etc., the article does not admit of satisfactory condensation. The basis of the plan suggested is for the colonel, assisted by the three regular army officers, to utilize the time before the men and horses arrive "to start in training the officers along exactly the same lines that the men are to be trained, and, by continuing the officers' drill and classes after the men arrive, he can keep the officers always a few days ahead of the men," thus tending to uniformity of instruction, economy of time, and prestige of the officers among the men.

CENSORSHIP (of the Press)

See
PRESS CENSORSHIP

CHILE

—Army

[A Lecture Given to the Caupolican Regiment. By 2d Lt. Ramon Ortiz Despott. *Memorial del Estado Mayor del Ejército de Chile.* Mar 1, '15. 4000 words.]

(NOTE: This lecture, given to the officers of the above named regiment on the 4th of September, 1914, considered the law of conscription, and the lecturer argued that such a law was not solely for the instruction of the military element of Chile, but was also to be considered a part of the education of the civilian population. He discussed the matter from the standpoint of sociology, pedagogy, physiology, morality, science, and general considerations.

It was endorsed by his brigade commander as of excellent quality, and recommended for publication in a journal of general circulation amongst the civilian public.)

—Army—Instruction and Training

See also
EDUCATION, MILITARY—INSTRUCTION IN CIVICS—CHILE
GYMNASTICS, MILITARY—CHILE

—Army—Service Regulations

[Our Military Regulations—Necessity of revising and modifying them. By Lieut. Col. Alberto E. Lara, Chilean Army. *Memo. del Ejército* (Chile), July, '15. 2600 words.]

Frequent changes and additions to the regulations, made without any definite plan or system, have brought about a state of confusion which seriously embarrasses the administration of the service. Much of the regulations that came to us ready made with the re-organization of the Army in 1906 is unsuited to the spirit of our people and of our institutions and even contrary to our laws and traditions.

Now that our military organization may be considered firmly established, this matter should receive careful attention and a revision based upon well considered principles should be initiated.

To facilitate ready reference, all matters pertaining to one subject should be grouped under one head, as for instance, organization, equipment, administration, discipline, etc. At the present time these subjects will be found treated in many different orders and in widely scattered paragraphs under different subheads. Regulations which for various reasons have been found inapplicable to our service and have, in consequence, been ignored, should be eliminated, while others which have demonstrated their suitability, should be emphasized.

Once the regulations for the several arms have been placed on a firm basis, modifications should not be made except after a working trial by the arm concerned.

It happens frequently that changes in words or phraseology are made because the terms in use have become antiquated—as for instance—the change from "Grand Guard" to "Outposts," from "Order of Battle" to "Formation for War." Such changes appear to have little advantage and are likely to invite confusion when the reserves are called back to the colors.

Additional regulations are needed to formulate certain well established practices in our service which at present are based solely on custom and recognized in a few isolated orders.

—Army—Supply and Transport

See

SUPPLY AND TRANSPORT—ORGANIZATION—CHILE

—Compulsory Military Service

[Obligatory Military Service. By Col. M. Navarrete. *Memorial del Estado Mayor de Chile*, Mar 1, '15. 6500 words.]

This is a study of the problem of recruitment and instruction of recruits since the adoption of the obligatory service law in Chile, the various methods of solution and the inconveniences of each, and the difficulties encountered in the application of the law.

The law was enacted Feb 12, 1896, and requires the military instruction of men over 20 years of age. To prevent unnecessary opposition, the military organization so drafted is called the National Guard, has the support of the press and public opinion, and satisfies the aspirations of the military authorities.

The first draft under the law was in 1901, for four and one-half months' service. This period of service obtained until 1903, when it was increased to six months. Beginning in 1908, the period was increased to one year, the recruits being called in two classes every six months. This division is receiving severe criticism from the military authorities, who favor a single draft of the whole contingent. At the same time, there is a tendency to urge the increase of length of service to two years; and, if this is not possible, then at least to 18 months, and to provide for a reserve.

The law provides compulsory service for all men between 20 and 45 years of age, except government and municipal officers.

One of the greatest difficulties encountered has been in the registration of names of men to be drafted. This has not been satisfactorily arranged, and various methods have been tried and rejected. Changes of residence have interfered greatly with all schemes proposed. The most practical method seems to be the issuance of cedulas to all electors, and to deny the right of suffrage to all not exhibiting such a cedula to the election inspectors.

—Navy

See also

NAVAL ARTILLERY — TARGET PRACTICE — CHILE

CHINA

—Army

See

SONSHI

—Army—Organization

See

ARMY—ORGANIZATION—CHINA AND JAPAN

CHLORINE

See

ASPHYXIATING GASES

CHRONOGRAPH

[Comparison of Two Chronographs. *Arms and Explosives*. Feb '15. 1100 words.]

Two chronographs, the Holden and the Le Boulengé, are used to measure a series of mechanically made times for the purpose of noting how the readings compare.

[This article will be of interest to officers at proving grounds. Its nature does not lend itself to useful condensation. A conclusion reached is that "the chronograph second is not quite the same thing as the clock second." The subject is continued in the March issue (2000 words) in an article which likewise defies abstraction. The general deduction from the experiments is that velocity results cannot be accepted as absolutely true to nearer than 2 or 3 f.s.]

CITIES

—Fighting in

See

STREET FIGHTING

CIVIL WAR (U. S.)

[The Last Battle of the Civil War at Columbus, Georgia. By Charles Jewett Swift. *Jour. Military Service Inst., U. S.*, May-June, '15. 6500 words.]

This fight occurred on Sunday, Apr 16, 1865. Part of the report of Gen. Jas. H. Wilson, commanding the Military Division of the Mississippi, is quoted. Gen. Upton commanded the Union forces. The article gives some of the details of the capture of Jefferson Davis and quotes several letters and reports to prove the contention that this, and not the battle of Selma, was the last.

See also

FORTIFICATIONS—FIELD—USE OF IN CIVIL WAR (U. S.)

NASHVILLE, BATTLE OF

—Losses

[The Truth About General Grant. Comment. *Army & Navy Jour.*, July 3, '15. 600 words.]

Replying to a criticism that Gen. Grant used his superiority of numbers over Gen. Lee "blindly and savagely," it is pointed out that Gens. Grant and Sherman were acting in unison against the entire forces of the Confederacy. In eight months of active campaigning from May 4, 1864 to Apr 9, 1865, the total casualties in Gen Grant's army were 124,390. His predecessors in like length of active campaigning had 139,751 casualties. Tabulated statistics from authoritative sources are given in proof. A campaign of rapidly succeeding engagement hastened the end and was economical both in men and treasure.

CLEMENT-BAYARD AEROPLANE

—Armored Monoplane

[Clement-Bayard Armored Monoplane. *Aeronautics*, May 15, '15. 200 words. Diag.]

This machine, intended chiefly for cavalry and artillery, is dismountable, the wings folding back along the fuselage. This is built of steel tubing, and all the forward part is protected by armor 1 millimeter thick.

COAST ARTILLERY

[*Note, for a rapid survey of the material under* COAST ARTILLERY, *that it is distributed on the pages indicated under the following geographical and subject subheads:*

Note also for much other valuable material on COAST ARTILLERY *the cross-references, not only after the General material under this head, but also after the material under many of the* COAST ARTILLERY *subheads.*]

[Once Again in Support of Large Calibers. By Luis Solano. *Memorial de Artilleria.* Madrid. Mar, '15. 9000 words. Table of large caliber guns, weights, projectiles, perforation, etc.]

Let me restate the following conclusions:

1. Warships may bombard naval bases and ports of refuge from the shortest possible safe distances, but never coast fortifications.

2. Coast batteries require calibres that will keep hostile vessels with supercalibers at much greater distances than 12 kms.: arm batteries with supercalibers.

3. Use A. P. Shot, having a high percentage of explosive: this requires supercalibers.

4. One A. P. Shell, 10 per cent explosive charge, fired from a supercaliber, carries farther and causes more destruction than the many from lesser calibers.

5. Cost, life and rapidity of fire are not reasonable inconveniences; the difference between these factors for the supercalibers and those for the 240 mm. cannon are at least small.

Captain Ripoll recognizes the possibility of a naval bombardment of seaports at exceedingly long ranges, but says that before such occurs the ships must engage the advanced coast fortifications. He again discusses the matter of life, cost, rapidity of fire.

He further states, besides, that batteries can employ for the destruction of warships projectiles and cannon different from the latter's. Kiel and Bremerhaven, cited by him as naval bases that fulfill these requirements, are defended by mine-fields and torpedoes, not by cannon. Not German but Spanish ports and naval bases demand our attention. Some are poorly defended, in others the batteries do not occupy the indispensable advanced position. This Captain Ripoll knows. He who demonstrates that employing lesser calibre cannon will assure their defence with equal efficiency and less expense than with supercalibers will merit his country's reward. Impossible: limiting the size of calibers is an absurdity.

All know that Captain Ripoll is not alone in favoring medium calibers and A. P. Shell. However, neither Bravetta nor Major O'Hern does. England, following other great nations, is now about to adopt supercalibers for her coast defense, judging her 234 mm. cannon to be of little use against modern battleships.

Suppose two batteries, one of four 240 mm. cannon, the other of two 381 mm's., each in a twenty minutes engagement, at 12 km. range (long for the former, short for the latter). Not one of the 24 hits by the 240 mm. A. P. shells will have perforated the secondary armor, no two probably having struck the same plate, their exterior explosions ineffective (20 kg. explosive charge being too light); but, as admitted by Captain Ripoll, just one hit by a 381 mm. A. P. shot would destroy a ship, therefore the effect of 12 hits would be most decisive. Such results show the lack of seriousness in the talk about the "one lucky round" from a supercaliber and the "rain of projectiles" from guns of lesser caliber.

Captain Ripoll cites Lieut. Cordiner's preference for shell fire to shot fire for calibers up to 305 mm. as an argument against shot fire for 381 mm. cannon. He errs as much therein as he does when he says I am biased in favor of shot fire. This statement is disproved by my fourth conclusion at the beginning of this paper.

Now as to the cost of two batteries: one of four 240 mm. L-46 Saint Chamond, the other of two 381 mm. L-40 Krupp. Consider separately: gun, carriage complete, projectiles, propelling charge.

1. For the first battery: weight of guns 105,600 kgs. cost 633,600 pesetas; for the second battery: weight of guns 148,800 kgs. cost 892,800 pesetas.

2. Four carriages and counterweights, complete, for the 240 mm. cannon 842,160 pesetas. Two carriages and counterweights, complete for the 381 mm. cannon, 721.380 pesetas.

3. Projectiles for an hour's engagement.

720 A. P. Shell, including explosive, for the four 240 mm. cannon 437,700 pesetas; 180 A. P. Shot, including explosives, for the two 381 mm. cannon 372,096 pesetas.

4. Weight of 720 propelling charges, 39,600 kgs., cost 514,800 pesetas; weight of 180 propelling charges, 43,380 kgs., cost 563,940 pesetas. Difference between cost of the two gun battery and the four gun battery, 121,956 pesetas, in favor of the latter; however the final difference is in favor of the 381 mm. battery, when the cost of emplacements, accessories and personnel are considered. Hence this battery is not only more efficient, but is cheaper than that of four 240 mm. cannon; also true for a 356 mm. battery.

The life of a cannon is shortened by increas-

ing its relative length, it increases with the caliber. Major O'Hern's and Rear Admiral Strauss' statements should convince Captain Ripoll that shortening the relative length, remodeling the forcing cone, the rotating bands and the powder charge prolong the life of a cannon. For a 240 mm. to endure as long an engagement as a 381 mm., its life should be twice as great as it fires twice as fast; Captain Ripoll's proposed 240 mm. L-50 has a somewhat shorter life than a 381 mm. L-40. Hence the latter is far superior to the former in life.

Should a 500 mm. or a 1 in. caliber be adopted for warships, coast defences must be so armed.

I favor long range mortars, using semi-perforating projectiles, 10 per cent explosive charge; but would exclude them, were a choice of mortars or guns imperative.

The bombardments of Cattaro and Lovcen warrant the deduction; that, warships with more accurate armament have the advantage over the land defences; conditions being equal, the advantage lies with the latter; stable bases do not justify the employment of less powerful matèriel; seaports are liable to bombardment at ranges of 16, 18 and 20 kms.

My final conclusion is that supercalibers will last longer and are less costly than medium calibers.

See also

Belcher elevating device (for coast artillery)

Coast defense

Coast defense—Naval bases

United States

[Guns, Ammunition, and Accessories. By Maj. Edward P. O'Hern, Ordnance Department, U. S. Army. *Jour. U. S. Artill.*, Mar-Apr, '15. 8500 words. Illust.]

(Extracts from a lecture delivered before the student officers of the Coast Artillery School at Fort Monroe, Va., Nov. 20, 1914.)

16-inch Gun and Carriage.—A disappearing carriage of the general type of the 12-inch, model of 1901 is being constructed for this gun. The following is a brief statement of the ballistics of the gun:

Weight of projectile	2400 lbs.
Weight of powder charge	660 lbs.
Muzzle velocity	2250 f.s.
Maximum range (15° elevation)	18,600 yds.

Computed penetration in K. C. armor:

Normal impact	*Impact 30 from normal*
24 inches, at muzzle	22.9 inches
20.6 inches, 5000 yds	18.4 inches
16.8 inches, 10,000 yds	15.5 inches

Mortars.—The model 1912 mortars are more powerful than any now mounted in the United States. They have a muzzle velocity for the outer zone of 1800 f.s. and a maximum range of 19,000 yards, an increase of 300 f.s. in velocity and of 4000 yards in range.

Panama Howitzers.—There are under construction some 4.7-inch howitzers with pedestal mounts for defense of the canal locks. These fire a 60-lb. shrapnel or shell and have a maximum muzzle velocity of 1300 f.s., and an extreme range of 10,000 yards. The ammunition is semi-fixed with the powder charge in three sections to provide for firing in any one of three zones.

Modification of 3-inch Seacoast Guns.—The 3-inch guns, model of 1902, are to be equipped with a new eccentric breech block, embodying features identical with the mechanism of the 3-inch gun, model of 1903. An effort is being made to apply a similar type of breech mechanism to the 3-inch, model of 1898 and to the Armstrong guns.

The allowances of reserve ammunition for the various calibres of cannon, as established by the Taft Board, are based upon the principle of providing in the continental limits of the U. S. sufficient to carry one-half the guns through a two hours engagement; and in the insular possessions and Canal Zone, double this allowance.

The insular possessions are fully supplied with ammunition and funds have been appropriated to provide the greater part of that for Panama.

Long pointed caps will soon be supplied to all A. P. projectiles in the insular possessions and it is hoped to begin soon the manufacture of caps for the projectiles in the U. S.

A satisfactory fuse for mortar shrapnel has not yet been developed. There is now being developed a point fused, high explosive shell for use in land firing with 12-inch mortars. By means of the point fuse it is expected to secure quicker action than is possible with the base fuse, and to secure detonation before the projectile is embedded in the ground.

Comparative tests from a 6-inch gun with projectiles equipped with rotating bands of varying hardness showed practically no difference in velocities and pressures, though the variations were somewhat greater with the hard bands.

The results of tests of single section powder charges have indicated a decided improvement in uniformity of velocities and pressures by the use of these charges. The single section will be equipped with a central core igniter and a small igniter of the usual form at each end of the section.

Of the primers now in service for cannon not using fixed ammunition, it is expected that no more combination electric-friction will be manufactured, and that the single wire simple electric will be replaced by a two wire electric primer. Efforts are being made to develop a satisfactory two wire electric primer.

The few reports thus far received on the new magneto firing mechanism for seacoast guns have been favorable. This mechanism consists of a hand operated alternating current generator furnishing power through a transformer near the breech of the gun.

Development of the 14-inch Gun.—When the first 14-inch gun was designed in 1907, it was with the intention of securing a gun of equal power but longer accuracy life than the 12-inch, 2500 f.s. gun, then the most powerful seacoast gun. The first gun was 34 calibers long with a muzzle velocity of 2150 f.s. and had an accuracy life of 250 rounds as compared to about 50 for the 12-inch with narrow band projectiles. Due to the tendency toward heavier armor on ships, the models 1909 and 1910 were made 40

COAST ARTILLERY—Continued

calibers long with a muzzle velocity of 2250 f.s. Now it is proposed to enlarge the powder chambers of existing guns by about 28.6 per cent adding 110 f.s. to the muzzle velocity, and a design is being prepared for a 50 calibre 14-inch gun which will have a muzzle velocity of 2525 f.s. with the 1660-lb. projectile, or 2750 or 2800 f.s. with one of 1400 lbs. This decreases the accuracy life by about 50%. It requires from two to two and one-half years to build a 14-inch gun, the lesser time when the shops at Watervliet are not overcrowded with work.

Turrets.—The turret has the advantage of giving overhead protection from ordinary fragments of projectiles and concrete, from aeroplane bombs, and howitzer fire except of very large caliber and from fire from the rear. It affords all-round fire.

Its disadvantages as compared with the disappearing carriage are: the larger target afforded, the liability of jamming, and excessive cost. As regards cost, the estimated cost is $530,000 per 14-inch gun for two gun turrets as against $308,000 per gun for single gun disappearing emplacements, both on the same site.

[Army 14-inch Turret. *Army & Navy Register.* May 1, 1915. 550 words.]

These turrets for installation on El Fraile are steel under test. The guns to be emplaced in these turrets are wire-wound and weigh 70 ton each. They will penetrate 12 inches of the best armor at 15,000 yards. The muzzle velocity is 2360 f. s. It is expected that the turrets will be shipped to the Philippines late in the coming summer.

[Coast Artillery Corps. *Army & Navy Jour.* May 15, 1915. 500 words.]

The proposition of transferring the Coast Artillery Corps to the Navy has been submitted to the General Staff. The reasons alleged in favor are the co-operation of the Navy and Coast Artillery in defending harbors and naval bases, and the possession by the Coast Artillery of quite a fleet of mine planters and other boats. A number of Naval Academy graduates have recently entered the Coast Artillery and are among its most efficient officers.

The proposition is as yet hardly more than academic discussion. The objections alleged are that in the question of seacoast defense in general and the land defense of seacoast fortifications in particular, the connection with the army is close, Coast Artillery troops are for this reason trained and equipped as infantry. The problem of defending our long coast line differs materially from the problem of coast defense in Europe.

[Editorial Comment. *Army & Navy Jour.*, Aug. 21, '15. 400 words.]

It is probable that four 16-inch guns will be authorized for the proposed forts at Cape Henry. The 16-inch gun has been recommended by a committee of the Fortifications Board as the type for the large guns in coast defenses.

The 16-inch gun will be a wire wound gun, 45 calibers long, mounted on disappearing carriage, and throwing a projectile weighing 2200 lbs. The larger caliber is for greater power, and not for increased range. The range of the 14 inch gun is sufficient.

[Improved Seacoast Armament. *Army & Navy Register,* Sept. 4, '15. 250 words.]

The 16-inch gun will be the type for main batteries of new fortifications, and for such of the older ones, as shall require new guns. Progress is being made in increasing the elevation-limit of installed 12-inch guns. After modification, these guns may be used as howitzers. The powder chamber of the 14-inch guns will be so modified as to admit of a larger powder charge. It is not impossible that 14-inch howitzers and 16-inch mortars will be adopted.

—Ballistics

[Notes on Direct Fire. By 1st Lieut. George A. Wildrick, Coast Artillery Corps, U. S. A. *Jour. U. S. Artill.*, Jan.-Feb, '15 25,000 words. Illus.; 21 pages ballistic tables.]

(Note.—The technical coast artillery methods are given in the full article to which reference should be had for these methods.)

These "Notes" are a compilation from various authorities and made necessary because of new methods of applying ballistic data, and because of works hitherto in use being out of print. The article is not a comprehensive treatise on the subject of gunnery, but treats only of the problems most likely to be encountered at the battery.

Type solutions are given of the ballistic problems most commonly confronting the battery officer.

Problems 1 and 2 are solutions for the ballistic coefficient for the day, using capped and long point projectiles.

Problems 3, 4, 5, 6, and 7 deal with the relations between muzzle velocity, ballistic coefficent, range, and angle of departure under range table conditions.

Problem 8 discusses corrections for jump, and for height of site and curvature of the earth.

Problem 9 deals with drift corrections.

Problem 10 takes up the computations and the methods of applying them in constructing elevation tables and graduating the range scale on the gun carriage.

Problems 11, 12, 13, and 14 illustrate the methods of making corrections for abnormal conditions, and the construction of the range correction chart for the range correction board.

Problem 15 takes up the determination of the muzzle velocity from trial shots or other firings and the construction of graphic velocity charts.

Problems 16 and 17 illustrate the methods of making corrections for slight variations in weight or caliber of the projectile.

The methods of making corrections for gun displacement from the directing point of the battery, for carriage slightly out of level, and for shifting the center of impact to any de-

sired place on the target, are described and illustrated.

—Correction

[A Displacement Corrector. By Sergt. Millard Kurtz, 38th Co., C. A. C. *Jour. U. S. Artill.*, May-June, '15. 500 words. Illus.]

This corrector is a device which permits the application of corrections for gun differences, in both range and azimuth. It is mounted on the mortar arm of the plotting board and obviates the necessity for difference charts, for corrector charts, or for sliding the mortar arm when firing from alternate pits. While it is designed specifically for a mortar plotting board, the corrector also can be used on a gun plotting board.

(For description and detailed drawings of the device, reference should be had to the complete article.)

—Correction Cards

[A Spotter's Card and Danger-Space Correction Card. By Capt. Hugh J. B. McElgin, Coast Artillery Corps, U. S. Army. *Jour. U. S. Artill.*, Jan.-Feb., '15. 1000 words. Charts.]

The purpose of these cards is to assist the battery commander to determine the corrections necessary to apply to the actual ranges to put his guns on the target.

The spotter's card converts "overs" expressed in terms of the height of the target into yards of range correction for the range to the target.

The purpose of the danger-space correction card is to assist the battery commander to determine, within reasonable limits, the correction to be applied to the first range to a new target, if he already has placed the center of impact of his guns on another target at a materially different range.

(For description and drawings see full article.)

—Fire Control—Checking Board

[A Mortar Battery Commander's Checking Board. By Capt. Claude E. Brigham, Coast Artillery Corps, U. S. Army. *Jour. U. S. Artill.*, Jan-Feb '15. 900 words. Illus.]

The object of the board is to place before the battery commander's eye, by means of curves plotted as the firing data is sent out, a graphical indication of the results of the work of the fire control personnel. From the curves, the battery commander can tell at a glance whether any material error has been introduced into the firing data, and thus a waste of ammunition and wild shooting are prevented.

For description and operation of the board reference should be had to the complete article.

—Guns—Small caliber

[Small Calibers in Coast Defense. By A. Ferreria Braga, Ensign of Artillery. *Revista de Artilharia*. Feb., 1915. 2750 words.]

Coast defense works everywhere have been largely calculated for action against armored ships. So far, however, in the present war, most of the naval operations, having in view the forcing of a harbor or strait, have been by small vessels—torpedo craft and submarines. It seems, then, that small caliber guns are as important as the heavy armament.

The standard medium gun is about a 15 cm. firing, perhaps, five shots per minutes. A submarine at best offers but a small and fleeting target, so that accurate adjustment is out of the question. Hence the 3-inch or 75 mm. gun, which substitutes rapidity of fire for accuracy of adjustment.

An attack by submarines, it is true, will be supported by other vessels; these, however, will not be heavy craft, which could hardly be risked in mine fields, but torpedo boats and destroyers. Against these also the 15 cm. gun is too slow and has not a sufficiently flat trajectory, and its power is more than sufficient.

Again, an examination of the armament of heavy ships shows that they are all provided with guns of this type for use against small craft.

It would seem indispensable, then, to have a good number of these light guns in our coast defenses. Many such guns and mounts are available, and should at once be mounted on the left bank of the Tagus.

—Head Cover for

[Strength of Head Cover for Modern Coast Batteries. Discussion appended to the project for a coast battery drawn up by direction of General Müller de Campas, Inspector General of the Fortifications of the Republic of Brazil. By Lieut. J. Francisco Duarte. *Boletim Mensal*, Feb '15. 3000 words. Tables.]

Head cover for coast batteries must be proof against high explosive shell fired from the most powerful modern battle ships. On account of the instability of floating platforms we have not to contend with high angle fire from ships and we assume therefore $5^\circ 43'$ as the maximum angle of fall. We may assume that the high explosive shell will burst upon impact. Assuming D in metres as the minimum effective thickness of head cover, L in kilos the weight of the high explosive charge of the shell we have: $D=0.48\sqrt[3]{L}$ for the 12 inch guns of the *Minas Geraes* type of battleship $L=25$ *kilos* $\therefore D=1.^{m}40$.

This agrees with the independent studies of General Rocchi, the distinguished Italian military engineer, studies based upon the impracticability of ships' guns striking several times in succession near the same place and upon the results of experimental firings against masses of concrete with high explosive shell.

Two methods of calculating the section of the steel beams which support the concrete overhead cover have been devised: Mariano Borgattit treats them as only serving to hold together the concrete while it is setting, and Rocci as further designed to take up and distribute the shock of the striking projectiles. The latter assumption involving too high cost was not used.

The overhead cover was finally taken at 2 metres and 3.7 metres over the observing stations. The beams are all of steel with double T sections, and are assumed as uniformrly weighted and suported at both ends.

[For detailed computation of dimensions of beams see text.]

COAST ARTILLERY—Continued

—Instruction and Training

See also

COAST ARTILLERY—RANGE FINDING—INSTRUCTION AND TRAINING

COAST ARTILLERY—TARGET PRACTICE

—Instruction and Training—Schools

United States

[Historical Sketch of the Coast Artillery School. By 1st Lieut. Robert Arthur, Coast Artillery Corps. *Jour. U. S. Artill.*, July-Aug. and Sept.-Oct., '15. 30,000 words. Illus.]

The intimate connection which existed between the Artillery School and post of Fort Monroe from the date of the organization of the school until the outbreak of the Spanish American War, makes it impracticable to treat of one independently of the other.

The name of Point Comfort was given to the sandy strip of land at the lower end of the Virginia Peninsula by John Smith and his colonists in 1607 when they were exploring the shores of Chesapeake Bay. Later, when the name New Point Comfort was given to a similar strip of land at the mouth of Mobjack Bay, the prefix Old was attached to the former.

The first fort was built at Old Point Comfort in 1609 by Captain John Ratcliffe and called Algernoune Fort but later referred to as Point Comfort Fort. This fort was rebuilt in 1632 and further strengthened in 1665, but even as strengthened it was inadequate as a defense of the harbor, for the Dutch twice burned the shipping therein during the latter part of the 17th Century.

In 1727, the construction of a new and larger fort of brick and stone was begun. This fort, named Fort George, was practically destroyed by storm in 1749. Just before the surrender of Yorktown, additional fortifications were thrown up around Fort George by Count de Grasse, admiral of the French fleet.

Soon after the Revolutionary War, the question of the defense of the "Maritime frontier" came up in Congress, and on February 28, 1794, a committee reported to the House of Representatives a recommendation that twenty-five ports be fortified, Norfolk but not Old Point being one of the list. The works constructed under this project were more or less temporary, and in 1807 Congress called for a new report which was submitted December 3, 1807. Again Old Point was not on the list but Norfolk was classed among the more important harbors. In addition to the defenses at Norfolk, it was recommended that gunboats be maintained in Chesapeake Bay.

The experiences of the War of 1812 directed attention to the importance of a proper system of coast defense, and the President was directed by resolution of Congress dated February 13, 1817, to have surveys made of the harbors and ports of the United States with a view to fortification. A joint army and navy board was appointed to survey Chesapeake Bay, Hampton Roads and York River. This board made a preliminary report January 24, 1818, recommending that the entrance to Hampton Roads be fortified, which fortifications should include a castellated fort on Rip Raps Shoal and an enclosed work at Old Point Comfort.

An estimate for an appropriation for this work was submitted to Congress on December 22, 1818. The works were planned by General Simon Bernard, Corps of Engineers, and were the most extensive of any projected up to that time. The fort at Old Point Comfort was named Fort Monroe, after the President, and that on Rip Raps Shoal Fort Calhoun, after the Secretary of War. The actual construction of the forts began in March, 1819.

In 1821 the joint board submitted its final report and in the same year the General Assembly of Virginia passed an act ceding 250 acres at Fort Monroe and 15 acres on Rip Raps Shoal to the United States. The deed of cession was not finally executed until 1838.

In 1820, military prisoners with three months or more to serve began to be sent to Fort Monroe to furnish labor for the fortifications. In July, 1823, Battery G, 3rd Artillery, arrived at the post apparently to guard prisoners. Early in 1824 a garrison was ordered to Fort Monroe.

In 1845 the work at Fort Monroe was practically complete, but at Fort Calhoun difficulties in securing a firm foundation were encountered, so that the Civil War found this fort still unfinished. Progress in artillery following the Civil War made it inadvisable to complete Fort Calhoun along the lines originally planned. Ultimately its name was changed to its present name of Fort Wool.

In 1824, as a result of the recommendations of a board of officers appointed for the purpose of studying and reporting upon the course of instruction necessary for the officers of the different arms of the army, the Artillery School of Practice was ordered established at Fort Monroe. Ten companies of artillery were ordered to Fort Monroe, to be organized as a regiment, and to be called the Artillery Corps for Instruction. Colonel J. R. Fenwick, 4th Artillery was ordered as the first commandant but as he did not join until the spring of 1825, the work of organizing the school fell to Lieut. Colonel A. Eustis, 4th Artillery, the second in command. Instruction was given to both officers and noncommissioned officers and covered only the routine duties of garrison. As organized the personnel included an instructor in mathematics, an instructor in engineering, an instructor in military drawing, and a professor of chemistry.

A library was formed at once and its first books were received in July, 1824.

The garrison was changed every two years in order to give all the companies of artillery the benefit of the school training.

Beginning with the year 1830, the demands upon the army became so heavy that it was necessary to make very frequent changes in the garrison of Fort Monroe and to send the companies from there into the field frequently.

As a result no systematic course of instruction could be followed, and in 1834 the school as such was ordered discontinued by the War Department.

In 1857, troops again having become available for the duty, the Artillery School was re-established. The garrison was to consist of two companies from each of the four regiments of artillery, one company from each regiment being relieved each year. All graduates of the Military Academy were to be ordered to the school for a year before joining their regiments. Major Harvey Brown, 2nd Artillery was ordered as commandant. The outbreak of the Civil War ended this second period of the school for want of troops.

On November 13, 1867, the school was re-established pursuant to the recommendations of a board convened for the purpose. Brevet Major General Wm. F. Barry, Colonel 2nd Artillery was detailed as commandant. One battery from each of the five regiments of artillerv was ordered to Fort Monroe and designated as an instruction battery. The course was for one year, until 1875, when it was changed to two years, and the student officers were assigned to the instruction batteries for duty. Instruction was both practical and theoretical, and included the subjects of artillery matériel, mathematics, engineering, law, and militarv history. The first class of this third period of the school was graduated on April 15, 1869.

In January, 1892, the first number of the *Journal of the U. S. Artillery* was published. It appeared as a quarterly and was edited by a committee of artillery officers.

The outbreak of the Spanish-American war caused a temporary suspension of the school on March 28, 1898.

On September 3, 1900, the school resumed operation. One battery from each of the seven regiments of artillery was ordered to Fort Monroe to form the instruction batteries. The course was changed to one year and the instruction was given by five departments, viz., ballistics and seacoast engineering, electricity, mines and mechanism, artillery chemistry and explosives, art and science of war, and special courses. The school for enlisted men consisted at the start only of a school for electrician sergeants which, in 1901, was moved to Fort Totten and made a part of the School for Submarine Defense. In 1902 the school for gunnery specialists, afterwards changed to the school for master gunners, began work. In 1907 the name of the school was changed to the Coast Artillery School.

In 1908 the School of Submarine Defense at Fort Totten was consolidated with the Coast Artillery School at Fort Monroe, the combined school located at Fort Monroe, and the present organization into three departments formed, viz., the Departments of Artillery and Land Defense, Engineering and Mine Defense, and Enlisted Specialists. The latter department now comprises the courses for master gunners, electrician sergeants, and radio operators. The officers' division includes an advanced and a regular course each of one year. Since 1912, owing to the shortage of officers due to the operation of the detached service law, there has been no advanced course.

—Instruction and Training—War Game

[Coast Artillery War Game Material. By Capt. Vernon W. Hall, C. A. C., N. G., State of Maine. *Jour. U. S. Artill.,* May '15. 900 words.]

The coast artillery war game board built by the Maine Coast Artillery Reserves in the Armory at Portland was constructed by methods differing slightly from those prescribed in the War Game Pamphlet.

An enlarged contour map of the Coast Defenses of Portland was drawn on the board, scale 100 yards to the inch. Brads and finish nails were driven on the contour lines, spaced about one inch apart, and left projecting above the board to heights appropriate to each contour on a vertical scale of 100 feet to the inch. The land features then were formed by working around the brads a mixture composed of four parts pulverized asbestos to one part Portland cement.

Emplacements were modeled out of cement, stations and buildings were made out of wood, and all were stuck into the land features while the cement mixture still was plastic. The water area was carpeted with light duck, painted the proper color.

—Matériel—Disappearing Guns

[Are Disappearing Carriages Suitable for our Coast Defense? By 1st Lt. H. Morath. German Army. *Artill. Monatshefte.* May, '15. 2500 words. 8 figures. 3 tables.]

(Note: A reply to Maj. Hillman's article concerning disappearing carriages in the *Jour. U. S. Artill.*, May-June, 1914.)

Practical results do not show that disappearing guns are superior to other types. To form a proper estimate, durability, safety of operation, cost, influence upon ballistic efficiency of the gun, and the amount of cover must be considered. Two types are used in the U. S., Buffington-Crozier and Howell. The Krupps also have a type. In the first, the trunnions of the supporting levers slide along a chassis; in the second and third these trunnions are fixed. The path described by the gun trunnions upon recoil is elliptical in the Buffington-Crozier and Krupp and circular in the Howell. Von Schwabach in his study on disappearing carriages has pointed out the defects of disappearing carriages. In the older Buffington-Crozier carriages, the uncontrollable frictional resistances were so great as to cause the supporting levers to break. Frequently the gun fails to return to firing position. Failure of the recoil mechanism to function makes loading difficult or impossible. Frictional resistances may also be the cause of the gun being fired before it has returned to the firing position. The Buffington-Crozier carriage must be rejected because of its inability to withstand the test of service firing under conditions of war. Because they require no protective cover, it is maintained that disappearing carriages are more economical. This is true no longer, due to danger of aerial

COAST ARTILLERY—Continued

attack and observation. Furthermore, a disappearing gun is not protected from hostile fire at longer ranges. Neither is it screened from hostile observation, even if aeroplanes are lacking, unless the emplacement is higher than the ship's observing towers. For these reasons, disappearing guns must be placed behind a protective armored cover, in which case they will cost as much as other types. The use of disappearing guns in the United States may be advisable because their gun emplacements are sufficiently elevated above sea level. In Germany this would be impracticable, because on account of our low shores the guns would have to be withdrawn too far inland. In general, it is much better to combat the enemy's ships with high angle fire guns.

Comparing the 16" U. S. disappearing gun with the German 28 cm. (11 in.) naval gun, considering the relative angles of fall and elevation between a ship and a coast battery for heights above sea level of 10, 30, 60, 100, 150, 200 and 300 meters, it is found that the maximum range of the 16" gun is not appreciably increased by an increase in the height above sea level. There is no dead space unless this height is over 200 m. If the gun has a 7° defilade it will be protected from all hostile fire under 10,000 yards. Insufficient data make it impossible to form any conclusions concerning the accuracy of fire of disappearing guns. The error in the angle of elevation must be great and variable. This, in connection with the uncontrolled resistances must make dispersion very great. Moreover the moment of recoil about an axis perpendicular to the direction of fire undoubtedly creates a tendency to very strong conical oscillations of the projectile along the trajectory.

—Organization

See also

SIEGE ARTILLERY—ORGANIZATION

(Article: How can the Royal Garrison Artillery be best organized to take part in an expeditionary force?)

—Range Finding

[Azimuth and Elevation Checking Device for Mortars. By 2nd Lieut. George F. Humbert, Coast Artillery Corps, U. S. Army. *Jour. U. S. Artill.*, Mar-Apr '15. 750 words. Illus.]

This device has for its object the detection of errors, from whatever source, in the data as posted in the mortar pit and on which the mortars of the pit are laid. It may be improvised in any mortar battery and is attached to some convenient point of the racer. Its usefulness depends upon the fact that if the mortar be laid at regular intervals and a chalk mark be made on the floor plate at a point determined by this device at each laying, these marks will be equally spaced if there are no errors in either the elevation or direction data, and the target has continued at a uniform speed.

[The Study of Trial Shots at Mortar Target Practice. By Lieut. Colonel Wilmot E. Ellis, Coast Artillery Corps. *Jour. U. S. Artill.*, Sept.-Oct., '15. 6000 words. 2 diags.]

In the *Journal of the U. S. Artillery* for July-August, 1914, the writer contributed a study entitled "The Graphical Solution of Problems in Exterior Ballistics," which was based upon the assumptions: that the mortar range tables issued to the service give the correct angular drift under all conditions; and that the maximum lateral effect due to wind was virtually the same as the maximum longitudinal effect. Subsequent experience at Fort Ruger, H. T., has shown that neither of these assumptions is true.

Based upon this experience the present study is submitted in which the following fundamental assumptions are made:

1. The maximum range effect and the maximum lateral effect of the wind must be determined separately.

2. The range effect of the wind in any direction of fire is equal to the maximum range effect multiplied by the cosine of the angle included between the direction in which the maximum range effect is obtained and the direction of fire considered.

3. The lateral effect of the wind in any direction of fire is equal to the maximum lateral effect multiplied by the cosine of the angle included between the direction in which the maximum lateral effect is obtained and the direction of fire considered.

Each target point gives two equations, one for longitudinal, and one for lateral deviation. Assuming projectiles all of the same form and weight, there will be six unknown quantities:—variation in range due to causes other than wind, the direction of the maximum range effect of the wind, and the amount thereof, the direction of the maximum lateral effect of the wind, and the amount thereof, and the lateral deviation due to causes other than wind.

It follows then, three target points must be used—at least in the preliminary firings.

Based upon the preceding assumptions a series of equations is deduced in which, applying the observed data from a series of trial shots with mortars, the unknown quantities may be evaluated.

Less than three target points will not furnish a complete solution of the problem unless we have determined some of the unknown quantities in previous firings.

(A series of five problems based upon data observed at trial shot firings at Fort Ruger, H. T., is solved to illustrate the principles involved.)

The basis upon which we have studied the trial shot problem is that each target point furnishes two equations, each equation containing one term dependent upon the direction of fire, and the other independent thereof. As an illustration, take the term, variation in range due to causes other than wind. These are range effects due to:—(a) change in muzzle velocity; (b) change in density of the air; and (c) error in the range table. We cannot determine any of these accurately. We do not measure the muzzle velocity; we cannot definitely calculate $\frac{\delta}{\delta}$, because the readings of our surface instruments are not reliable

indices of readings in the upper levels of the atmosphere; and we do not know the range table error corresponding to the elevation used.

The mortar problem does not admit of an exact solution. Therefore our experimental firings should be conducted with a view to determining the relation between mean wind effects and the indications of wind paraphernalia suitably located. Then we may be qualified to proceed to the goal of our training, to open fire at once on an actual target, correcting our fire by observation as the target proceeds from zone to zone through the field of fire.

[Observation of Fire. By Major Edwin Landon, Coast Artillery Corps. *Jour. U. S. Artill.*, Sept.-Oct., '15. 4500 words. Illus.]

Two kinds of observation of fire are recognized in our service; viz., spotting and instrumental. For guns of 5-inch caliber and above, arbitrary range corrections now are prohibited at target practice; a wise prohibition when the order first was promulgated, but it is believed that now we are in a position, as far as equipment and training go, to resume consideration of what may be accomplished by observation of fire in the way of advantageously adjusting the fire of mortars and of guns of all classes.

Our present practice of prohibiting arbitrary corrections is based upon the fact observed in a majority of target practice records that "The variations (in velocity) in any group of trial shots continue practically the same throughout the series of record shots which follows that group; or, in other words, the dispersion of the record shots has been practically the same as the dispersion of the trial shots which furnished the data for these record shots." Exceptions to this rule have been observed, sufficient in number in the opinion of the writer, to make it seem worth while to see how observation of fire, properly used, might have helped.

The correct theoretical guide to the proper use of observed results of fire is believed to be the probability of hitting as determined not only from trial shots but from all other accurately observed results from the same gun and mount. The practical handling of results presents many difficulties, but what appears to be a simple solution has been tried with mortars in a recent practice at Fort Crockett, Texas.

There are two essential points of difference between this method and others.

(a) The results obtained are compared with the point aimed at, and not with the target at the instant of splash.

(b) The method provides for making a graphic representation of all results obtained which it makes and applies without the necessity of computation.

The equipment used was the standard fire control apparatus slightly modified to suit special conditions of the practice, and in addition, a "spotting board"—so called—but really another plotting board with arms pivoted at the directing point of the battery and at spotting stations. The spotting stations were equipped as are base end stations.

The position of each set-forward point was plotted on the spotting board by its range, and azimuth from the directing point of the battery. This was the point aimed at. For purposes of determining range deviations, it was assumed that each shot was a line shot. The azimuth of the splash at the spotting station was read and set off on the spotting board. The intersection of the spotting station arm and the line of direction through the set-forward point gave the location of the splash. Deviation from the set-forward point was then measured on the latter line. Deflection corrections were obtained independently by means of an azimuth instrument in the battery commander's station.

In applying the range deviations on the range correction scale, pins were inserted at the proper points on the slide. A graphic representation of the fall of the shots with reference to the point aimed at, thus was obtained, and the slide moved to the "center of impact" of the pins, thus correcting for the mean range deviation each time.

When salvos were fired, the spotter observed on the center of impact of the salvo. To accomplish this satisfactorily required some preliminary training of observers, which was given at the war game board indoors and at subcaliber practice.

(For a full description of the apparatus and the methods of operation, reference should be had to the complete article.)

—Range Finding—Angular Travel Rule

[The Angular Travel Rule. By 2nd Lieut. Fred M. Green, Coast Artillery Corps, U. S. Army. *Jour. U. S. Artill.*, Mar-Apr '15. 2500 words. Illus.]

The angular travel rule is a device for determining the angular rate of travel of a target with respect to a seacoast battery. It takes the place of the tally dials on the plotting board.

(For a complete description of the rule and its operation, reference should be had to the full article.)

The advantages claimed for the travel rule are: Greater speed and accuracy, a reduction in the duties of the plotter, less skill required of the operator, delays by the operator do not hinder the work of the plotter, one man is removed from around the plotting board, and erratic values of travel are more quickly detected.

In the use of the tally dials to determine the angular travel, the following disadvantages are noted: Longer time required as compared with that for the travel rule, the plotter's attention is distracted, and a greater number of inaccuracies are possible.

—Range Finding—Correction for Pit Displacement

[A Device for Correcting for Pit Displacement in Mortar Batteries. By 1st Lieut. John H. Pirie, Coast Artillery Corps, U. S. Army. *Jour. U. S. Artill.*, Mar-Apr, '15. 600 words. Illus. with drawings of the device.]

This device is designed to make both the range and the azimuth corrections to the laying

COAST ARTILLERY—Continued

data for mortars made necessary by the displacement of the mortar pit from the directing point of the battery; and thus eliminate the inaccuracies arising from the present method of laying all mortars of a battery on data computed for the directing point.

The device is mounted on a slide which is put on the mortar arm on the plotting board. All corrections are made on the board and correct data are posted in each pit. It is intended primarily for use when the pits are fired alternately. If battery salvos are fired, a range and deflection board for each pit must be used.

—Range Finding—Instruction and Training

[Vessel Tracking During the Indoor Period. By Capt. Charles C. Burt, Coast Artillery Corps, U. S. Army. *Jour. U. S. Artill.*, Mar-Apr, '15. 500 words. Illus.]

The 4th Company, Coast Artillery Corps, has improvised means for practicing vessel tracking during the indoor season and inclement weather. The instruction is held in the dining room of the company barracks; a small ship model being observed and plotted as it is moved about a table. All operations of the plotting detail are carried out. Any course desired may be obtained by manipulation of the target through a towing device, and proper orientation of the observing instruments.

The system is applicable where the weather during the indoor season is too severe for the plotting detachment to proceed to or work in their stations.

See also

COAST ARTILLERY—INSTRUCTION AND TRAINING

COAST ARTILLERY—TARGET PRACTICE

—Range Finding—Range-Elevation Board for Mortars

[Range-elevation Board for Mortars. By 2nd Lieut. Octave DeCarre, Coast Artillery Corps, U. S. Army. *Jour. U. S. Artill.*, July-Aug., '15. 2000 words. Illus.]

This board was designed to make the necessary corrections in mortar elevations when, due to abnormal conditions, the center of impact of the shots fired does not fall on the target.

The board consists essentially of a chart constructed with ranges as abscissae and muzzle velocities as ordinates. The horizontal scale is 1 inch to 150 yards, and the vertical scale is 1 inch to 25 f. s. Curves are drawn for each 1000 yards range, each 2 seconds time of flight, and each 10 minutes elevation, the elevation line for 59 degrees being assumed vertical. The chart is fastened to rollers mounted in a frame of wood. A horizontal range ruler carries a movable range tape, pointers and an index.

A necessary adjunct of the board is a zone to zone correction chart to determine the additional correction to be applied when passing from any zone to the next. This chart is based upon the percentage variations of powder strength as published by the Ordnance Department, U. S. Army.

(For a full description of the board and its method of operation reference should be had to the complete article.)

—Range Finding—Range Officer's Check-Board

[A Mortar Check-Board. By 2nd Lieut. Frank R. Sessions, Coast Artillery Corps. *Jour. U. S. Artill.*, Sept.-Oct., '15. 750 words. Illus.]

This board is a device which enables the battery commander or the range officer to keep track of the work of the position finding service of the battery. A graphic record of the successive changes in the uncorrected azimuth during each observing interval is kept, and it is possible to note at a glance, any excessive jumps in azimuth, or to tell approximately the azimuth of the target at the end of the next observing interval.

(Reference should be had to the complete article for a description of the construction and operation of the board.)

[Range Officer's Check-Board. By 2nd Lieut. Harold DeF. Burdick, Coast Artillery Corps. *Jour. U. S. Artill.*, Sept.-Oct., '15. 1500 words. 1 chart.]

This check-board was devised to enable the range officer to check up the work of the range section at a time when a check is needed; viz., when the data go to the guns.

The following named functions of the fire control system are kept graphically on the board:—

1. Actual range of plotted point.
2. Range of set-forward point.
3. Corrected range.
4. Deflection.
5. Time of each shot.
6. Elapsed time of the series.
7. Arbitrary range corrections.
8. Arbitrary deflection corrections.
9. Complete track of the target when referred to ranges.

(Reference should be had to the complete article for a description of the construction and operation of the board.)

—Range Finding—Spotting

[Spotting for R. F. Batteries: Training Spotters and a Description of a Range Correction Rule. By Capt. Hugh J. B. McElgin, Coast Artillery Corps, U. S. Army. *Jour. U. S. Artill.*, July-Aug., '15. 1300 words. Illus.]

Spotters may be trained indoors with the aid of miniature rapid fire targets (12" by 5"), a handkerchief, a cord about 60 feet long, and a large cloth-covered table. The targets are towed across the table and splashes are indicated by use of the handkerchief. The spotter reports his estimate in terms of height of target. His estimate of the distance over or short is verified by using the 60-ft. string to produce his line of sight.

The range correction ruler is designed to furnish corrected ranges for rapid fire batteries. It consists of a ruler from 3 to 4 feet long carrying a sliding bar. Four scales are mounted: two on the ruler and two on the sliding bar. These give corrected range and total range correction, and actual range and any individual range correction.

The advantages claimed for this ruler are: that corrections up or down are made by moving the sliding bar in the corresponding direction, all corrections are made without mental calculation on the part of the operator, and the initial correction for subsequent firing may be obtained from the total correction scale.

(For full description and method of operation, see complete article.)

—Ranges

[Actual and Theoretical Ranges of the United States Coast Defense Guns. *Scientific American*, May 22, '15. 1500 words. Diag.]

The actual ranges, shown in the diagram, are those obtained by the coast guns on their present mounts, and the theoretical ranges, also indicated by the diagram, are those which could be secured by changing the mounts to permit an elevation to forty-five degrees.

At the time when the 12-inch rifles and mortars now installed were built for our fortifications, no such guns were carried on naval vessels as are found to-day.

Seven to ten thousand yards was considered the maximum possible range for warships and it was considered that a range of thirteen thousand yards was sufficient for practical defense purposes. Consequently a 10-degree elevation was fixed as the maximum for the rifles, this corresponding to a 13,000-yard range for a 12-inch gun firing a 1070-pound projectile with a muzzle velocity of 2250 f. s.; and the 12-inch 15 caliber mortar, firing a 1046-pound shell with 1200 f. s. velocity had a range of 11,750 yards.

To meet the increased naval range, an increase must be made in the range of the defense guns. This can be accomplished in two ways: by decreasing the weight of the shells, thus increasing the initial velocity, or by maintaining the weight of the shells and increasing the elevation, or by both. Increasing the elevation to 15 degrees gives a range of 17,000 yards for the 12-inch rifles with the same weight of projectile; decreasing the weight of the projectile to 700 lbs. gives a range of 15,500 yards with a 10-degree elevation, and 19,000 yards with a 15-degree elevation.

The 14-inch gun, with 15 degrees elevation, firing a 1660-pound shell with initial velocity 2366 f. s. gives a range of over 19,000 yards; and a shell of 1200 pounds increases the range to 21,000 yards. The 16-inch gun, with 15 degrees elevation and a 2400-pound shell, attains 21,000 yards range.

Greater ranges are also obtained by lengthening the 12-inch gun from 35 to 40 calibers and increasing the powder charge,—the maximum being 22,000 yards with 15 degrees elevation.

Calculations show that if there were any occasion for using the maximum theoretical range of the 12-inch rifles, 45 degrees elevation with a 35-caliber gun would throw a 1070-pound projectile 35,000 yards; and that the 14-inch and 16-inch guns would reach a range of 46,000 to 49,000 yards.

Even this is not the limit. Reliable calculations show that it is possible to build a gun that will carry forty-nine miles, though, of course, the erosion due to the enormous heat of the gases would soon destroy the accuracy of such a gun.

The recent bombardment of Dunkirk would be perfectly feasible for one of our 12-inch guns mounted for high-angle fire.

—Target Practice

[Coast Artillery Target Practice: Its Purpose and How Best to Accomplish It. By Maj. Edwin Landon, Coast Artillery Corps, U. S. Army. *Jour. U. S. Artill.*, Mar-Apr, '15. 6200 words. (First Prize, Essay Competition, 1914.)]

The words chosen by the *Journal* for the title of this article reflect the influence of "The estimate of the situation"; they call for a statement of the "Object in view" or "Mission," and for a "Decision." Obviously the chief concerns of the superior are that the tasks of his trained subordinates shall be stated clearly, and that the necessary means to accomplish them are supplied.

This "rational" system develops to a far greater degree the efficiency, resourcefulness, and co-operation of the subordinate than does the "jural" or "one fountain head" system, without in any way minimizing the responsibilities of the superior.

In France and Germany, where the "rational" system of training has been most highly developed, each grade is required to perform its part in the training.

Although our army traditions are closely associated with the "jural" system, the present organization of the Coast Artillery with its recently created district commands under supervision of a special section of the general staff, and its possession of a school attended by all its officers, favors the quick adoption of the "rational" system.

Regulations for the Instruction and Target Practice of Coast Artillery Troops, when adapted in form, as they now are in spirit, to the "rational" system will be greatly simplified and abbreviated.

There is need of a formal estimate of the situation in the case of an administrative order as in the case of a tactical order. Based upon this idea, we have in Coast Artillery Target Practice, an estimate of the situation from the point of view of the War Department, with its object, viz.: in preparation for war, to develop and to test proficiency in gunnery and submarine mining under service conditions including exercise of tactical command. We must next take into account obstacles and available resources.

The following principle should govern: All organizations, upon attaining a minimum standard of excellence in elementary forms of practice, should progress to more complicated problems without being held back by organizations not so far advanced.

Efficient battery, fire, and mine commands under service conditions with the facilities which may reasonably be expected to be available at the outbreak of war are wanted. Green officers should not suddenly be expected to perform their duties under service condi-

COAST ARTILLERY—Continued

tions but should be given experience in the conduct of fire at schools of fire to be organized supplementing the Coast Artillery School.

Duties now assigned to umpires should be taken over by the district or other commander or his staff.

Kind of targets to be used should be decided upon by the officer allotting the funds for any given practice.

The War Department might prescribe the details of recording the information necessary to keep track of the performance of the powder used; but such records should not be insisted upon to the detriment of the practice as a service test.

A critique takes the place of the figure of merit.

Mine practice should have a money allowance allotted to it by the district commander. The mine commander should be confronted with the problem of operating mines and using batteries at the same time at the same or different targets.

Co-operation between the Aviation Corps and the Coast Artillery at target practice should be arranged.

To simulate service conditions, it has been suggested that an idle army transport be used to transport the district commander, his staff, the target matériel, and personnel for handling this matériel from harbor to harbor. This would furnish a good towing vessel and introduce the element of uncertainty as to exact time of appearance and practice.

Execution. Upon receipt of the War Department order the district commander should make an estimate and issue his orders. He should decide all details but allow coast defense commanders great latitude in executing the target practice problems.

The district commander can arrange ammunition allowances and target courses to create special situations which would test out the plans of the coast defense commanders for fighting their commands. Coast defense commanders would be left in the dark as to their ammunition allowance and could be required to prepare all ammunition on hand for immediate use.

The point is, to present a real service problem and to determine at the time of firing just when sufficient ammunition has been expended to give results which will be valuable for a critique. By placing all target handling details and questions under district headquarters, elements of uncertainty and surprise would be introduced as effectively as possible in time of peace.

[Coast Artillery Target Practice: Its Purpose, and How Best to Accomplish It. By 1st Lieut. Creedy C. Sheppard, Coast Artillery Corps, U. S. Army. *Jour. U. S. Artill.*, July-Aug., '15. (1st honorable mention, Essay Competition of 1914.) 6000 words.]

Training for target practice should be as nearly as possible under war conditions, and all conditions entering into war efficiency should be considered in determining the results of target practice; since in time of peace target practice is the only opportunity given the Coast Artillery to fire its guns. The purpose of coast artillery is to disable or destroy the enemy's ships. To accomplish this requires effective hits.

In action, the decisions made by coast artillery commanders of all grades will be based upon a thorough knowledge of the character, speed, and vulnerability of the enemy ships; their course and probable intentions; and the capabilities and limitations of the personnel and matériel ashore. Requirements upon which to base similar decisions should be present in target practice.

The introduction of the coast artillery war game into our training gives an opportunity for the exercise and training of our judgment in handling the coast artillery matériel. The real test of our knowledge, skill and training is the effectiveness of our fire in battle, and as target practice is the nearest approach to battle, corresponding tests should be introduced into it.

Targets should represent some type of hostile ship and should be towed over a course conforming to some probable form of attack. Splashes should be plotted on a silhouette of the ship represented, and the effect of the hits should be evaluated from our knowledge of the ship and its vulnerability. Suitable numerical values might be given to hits on various parts of the ship, according to the damage to be expected, and credit for effectiveness be given the company by translating these values into a third term of the figure of merit, to be known as the "E" term and to have a maximum value of one-half of the maximum figure of merit.

Immediately after the practice, a complete analysis of its results should be made by a board of which the battery commander should be a member. The analysis should separate errors of personnel, errors of matériel, and errors of judgment. The second practice should not be held until the first practice has been analyzed, in order that defects encountered in the first practice may be corrected in the second.

To attain success in target practice, each member of the command must have interest in and a thorough knowledge of his duties and skill in their performance, and in addition there must be team work in the battery as a whole. These same requirements are essential to the success of the indoor and preliminary instruction, which should be so conducted as to maintain the interest and develop the skill and knowledge of the men.

Frequent subcaliber practices should be held during the outdoor period. Harsh criticism should be avoided, but measures should be taken to correct mistakes at once and thus avoid their repetition. A careful study of the past performances of the battery should be made, and the result put on record for reference by the battery commander and his successors.

See also

COAST ARTILLERY—RANGE FINDING

COAST DEFENSE

See also
COAST ARTILLERY
See also subhead COAST DEFENSE under *names of specific countries.*

—Against Naval Attacks

[Thoughts on Naval Attacks Against Coast Defenses. By (Marsyas) Major B. Schmidt-Reder, ret. German Army. *Artilleristische Monatshefte.* Jan., 1915. 2000 words.]

Naval vessels are nothing more than floating batteries, using only direct-fire guns because the principal target will always be the hostile navy. Cover being impossible, they depend for protection upon speed and armor. They lack high-angle-fire guns, and are vulnerable to their attack. Ammunition supply, especially for heavy guns, is limited because naval battles will always be of short duration and the life of these guns is relatively short. Naval gunnery becomes an art because of unstable mount of the guns.

Conditions are different for coast defenses, which may be made practically invisible by proper use of terrain. To depend upon armor is dangerous—example, Liége, Antwerp. Unlike the navy, the size of guns and the ammunition supply is unlimited. The greatest advantage is use of high-angle fire, so dangerous to naval vessels. Coast artillery gunnery is not simple, but by proper preparation and scientific technical appliances can be made so.

An attack of coast defenses by the navy without co-operation of a land force is usually doomed to failure. Coast defenses are very vulnerable to land attacks on the flank and rear. Provision should therefore be made against surprise by landing parties. If organized land attack is probable, lines of defense and a reserve of mobile artillery are necessary. On the water side no reserve is required, because the direction of attack is always known. Use of cover is always better than use of armor, which is expensive. Money saved can be spent on more guns.

[Navy *vs.* Coast Defense. By First Lieutenant P. W. Madsen. *Dansk Artilleri Tidsskrift.* Jan and Mar '15. 20,000 words. Numerous plates and tables.]

An interesting article in view of the recent English-French attempts to force the Dardanelles without the assistance of land forces, successfully executed, by the way, by Admiral Sir J. T. Duckworth in 1807.

"In states that may send fleets to combat against sea coast defences, the navy undergoes a steady and certain development.

"Through yearly additions and withdrawals of ships from the fleet, the material is constantly in good condition.

"As a ship class is, as a rule, constructed within three years, the last class will always meet the tactical demands and embody the technical results of the period. A similar development of sea coast defences is not the case. Here the development is by bounds, and ten or twenty years may pass between improvements.

"As a result of this difference in progress, the question before the aggressor is how far it will be necessary to send his best material into the fight, or if he can send his 'next best,' and still secure the preponderance which will assure success."

[Ships of War and Seacoast Batteries. By Carlo Ederle, Lieut. of Arty. *Riv. Mil. Italiana,* May, '15. 2000 words.]

The fight between the old castles of Sedd el Bahr and Kum-Kaleh at the Dardanelles, and the Anglo-French fleet, throws light on what some call the legend of the superiority of land works over ships. It appears that the largest effective pieces in the forts are 4 Krupp guns of 356 mm. and 8 of 240 mm., and various others of 100 to 152 mm. The Allies had in March over 40 vessels, with a total armament of 16 pieces of 38 mm., 62 of 305 mm., 2 of 274 mm., 8 of 254 mm., 26 of 234 mm., 28 of 190 mm., and other smaller guns.

Steam vessels should be more effective than the old sailing ships, but the Napoleonic saying that one gun on shore is worth ten on ship still seems to be true, if it does not fall short of the proper proportion. There are only three cases in modern history of successful action against a fort conducted exclusively by a fleet—the bombardment of Copenhagen by Nelson, the destruction of the Kinburn forts on the Dniester by the French, and the capture of Fort Morgan by Farragut.

Practice has shown that at a range of 14 km. a coast battery of 305 mm. mortars, with good range-finders, can execute a most effective fire such as no superdreadnought can resist. One hit will destroy a ship, to which the battery may be entirely invisible. None of the accessories of the defense, such as submarine mines and torpedoes, can be destroyed or removed until the forts are silenced.

It is noted that 305 mm. mortars are not the limit in size, as guns and mortars of 406 mm. are now being installed in some coast forts. Experience justifies the historic opinion of Admiral Selwynd: "A fort . . . is a thing to be avoided."

[The Tactics of Harbor Defense, including a Discussion of Plans for Defense Against Naval Attack and Orders for Carrying them into Effect. By 2d Lieut. Reuben N. Perley, Coast Artillery Corps, U. S. Army. (Second Prize, Essay Competition of 1914.) *Jour. U. S. Artill.,* May-June, '15. 4200 words.]

This subject includes (1) the tactical disposition of (a) matériel; and (b) personnel; and (2) the evolutions necessary for adequate harbor defense.

We first must consider the most probable methods of naval attack. Modern navies are divided into (a) heavy, (b) medium, and (c) light ships, and (d) auxiliaries.

Heavy ships are built primarily to seek out and destroy the enemy fleet, but may take part in attacks upon fortified harbors. A run-by by heavy ships, before the major caliber batteries have been destroyed, is not probable, on account of the important armament, great cost and time required for construction of a single

COAST DEFENSE—Continued

ship, the danger of running aground, and the possibility that after the run-by the shore batteries can maintain the ship under fire. The real danger from heavy ships lies in the fact that our present major caliber shore batteries are outranged by the guns of the latest type heavy ships.

We may expect the attack of heavy ships to take the form of: (1) a reconnaissance in force; (2) a direct attack at long range; or (3) a secondary attack to cover auxiliary operations. To meet such attacks guns of equal range and power to those on shipboard are required by the shore defenses.

Medium-draft ships are useful in raids on outlying searchlights and stations from comparatively safe water areas. The defense against such attacks lies in adequate concealment and the use of periscopic observing instruments.

Destroyers and submarines are likely to penetrate harbor defenses under cover of fog or smoke. To guard against them, the mine fields and rapid fire batteries must be efficient and ready, and a few destroyers and submarines might be assigned to the harbor for purposes of counter attack.

For protection against aeroplanes and landing parties, all elements of the defenses should be carefully concealed and should be defended by anti-aircraft guns, infantry and field artillery.

The station of the coast defense commander should be centrally located, not far in rear of the main line of batteries, with a good field of view, and should be in direct communication with all fort commanders, commanders of coast artillery supports, and the local naval commander. The coast defense commander should be the tactical commander of the defenses, controlling the batteries in a general way through fort commanders in whose hands rests the execution of details. The orders of the coast defense commander should be short and should cover only the general requirements of the situation.

Constant reports of information and action taken from all subordinates would keep the coast defense commander informed of the progress of the action, the intelligence officer at the central station keeping a graphic record of events on a miniature war-game board located in the station.

The coast defense commander co-ordinates the information service, and gives general instructions for reconnaissance by the naval defense and aircraft service assigned to the harbor.

—By Mines

[The Submarine Defense of Seacoast Fortresses. By Lieut. Manuel Barbosa Basqueiro, Portuguese Navy. *Rivista de Artilleria*, Apr '15. 1200 words.]

[Introduction to a Portuguese translation of a Russian article, already published in English translation in the *Jour. U. S. Artill.*]

Coast batteries must expect attack by ships, if the enemy gains control of the sea, and must neglect no means of defense. Mines are easily and quickly laid, and every shot is a hit. Ships cannot maneuvre in a mined area, and mine removal is very difficult.

[Automatic Submarine Mines. *Revista de Artilharia*, Sept., '15. 2600 words.]

(Translation from the *Jour. U. S. Artillery*, for Aug., 1912.)

[The Importance of Submarine Mines in the Defense of Ports. By Manuel Barbosa Casqueiro, 1st Lieut. of the Fleet. *Revista de Artilhara*, Sept., '15. 2600 words.]

Previous articles on the same subject have endeavored to show the importance of submarine mines for this class of defense. An article appearing in the *Jour. U. S. Artillery* shows the extreme importance of submarine mines.

Captain G. Elia of the Italian Navy invented a mine and became associated with a firm manufacturing war materials. They developed and perfected the Elia Mine and furnished them principally to the British Navy.

The mine used by this country is not anchored and it is cast en bloc. While this system has some disadvantages it has many advantages. As many as 35 of these mines have been launched in as many seconds from the stern of a boat. The excellence of the casting has been proved by the handling and recovering of mines. The detonation of one mine will not harm another 30 meters off. The mines can be placed with very small intervals, less, in fact, than those employed by any other country.

Ultimately the United States will have interested various firms in the manufacture of torpedoes and mines so that in case of necessity she can turn to them for her own supplies. England has developed the Vickers, France, Breguet, and Germany the Krupp factory.

Mines cost but little to manufacture and their destructive power is illustrated in the cases of the *Bouvet*, the *Ocean*, and the *Irresistible*.

The *Ueberall* of June 3, 1914, had an article in which Rear Admiral Stiege gave marine mines the highest place.

The attention of officers of both the army and navy is invited to the low cost of preparing the coast for defense with mines as compared with other means. In Spain the plan is to use as mine planters ships of the navy that have passed their period of usefulness as battleships. This decision will materially alter the naval program.

[A Cylindrical Automatic Contact Mine. *Arms and the Man*, Nov. 11, '15. 250 words. Diagram.]

[Reference must be made to the original article. It may be remarked, however, that once down, the mine could not be taken up, but must be exploded.]

See also
MINES—NAVAL

—By Torpedoes

[Coast Defenses. *Revista de Artilharia*, May-June, '15.]

[Note.—Almost the entire number is taken up by a discussion of Coast Defenses and the means to be employed in accomplishing this defense. Attention is also given to the mobile forces and their relation to Coast defense. The technical discussion is confined to Artillery and Submarines. For the latter, an elaborate system is worked out in detail, although its application is confined to the coast of Portugal and more particularly to Lisbon.]

In presenting arguments for both a larger navy and a larger and more adequate coast defense, Mahan and Goldsborough are quoted freely to show that either form of defense is incomplete without the other. Forcible attention is drawn to the old Monitor type of warship.

The greatest technical attention is however given to the use of torpedoes. Torpedo stations are called the nerve centers of submarine defense of coast forts. They are constructed to destroy enemy artillery, and they must be properly grouped for this purpose. If all the lines of torpedoes are grouped in one station, the service will be extremely complicated. If there are too many stations, or if the staff in the fort is limited, the men will be overworked.

The question of communication is most important. The commander of the torpedo defense must have direct telephone communication with each station. Land cables must be perfectly protected from the possibility of damage by shell fire.

Each torpedo station must contain tool house and work shop, guard house, room for commander of station, room for soldiers, armory, kitchen, toilet room, and must be equipped with small boats and signal mast.

Stations for electric contact mines are planned after the same style as the stations for submarine defense. Again communications are of the greatest importance. The commander should have a separate line of communication distinct from all other lines, no matter for what purpose used.

The number and location of stations will be determined by local tactical considerations. Detailed plans for both large and small forts are given.

—Land Defense of Sea-coast Fortifications

The Use of Our Seacoast Guns and Mortars in Land Defense. Lieut. Meade Mildrick. Coast Artillerv Corps, U. S. Army. *Jour. U. S. Artill.*, July-Aug., '15. 3000 words. Illus.]

Although the armament of our seacoast defenses is installed primary for defense against naval attack, it may be used to assist the Coast Artillery Supports in repelling land attacks.

A system of fire control for use against land targets is described. The essentials of the system are an accurate military map and a good scouting force.

The map should be to a scale of 3-inches to the mile and cover an area within a radius of 20,000 yards of the fort. An azimuth circle with the fort commander's station as a center is printed on the map.

Targets are located by observation and plotted on the map by the observer. The observer then reports to the fort commander the range and azimuth from the fort commander's station. Firing data for the battery assigned to attack the target are determined by relocation at the battery and the observer reports the fall of the projectile. A second method of locating the target with reference to the fort Commander's station is by using the square system, which has some advantages over the system first named in that the scout can fold his map and may use a rough blueprint.

To develop the necessary trained scouts and lines of communication land defense target practice should be held. The target should be set up in a suitable land area where bursting shell could do no damage. A situation would be given out by the umpire; the scouts would be sent out to locate the target, and the firing against it would be taken up in accordance with the methods just described.

—Naval Bases

[The Armament of Naval Bases, Some General Ideas. By J. Tenorio. Captain of the Department of Cartagena. *Mem. de Artill.* (Spain), June, '15. 10,000 words.]

Attacks against naval bases can be of but three classes; by way of the sea, land attacks, or aerial attacks.

The latter are still in the period of development. The confidence that is reposed in aeroplanes and dirigibles as combat elements appears illusory. The dirigible offers a magnificent target to the anti-aircraft guns especially since, in order to accomplish effective results, it must approach somewhat closely in the field of fire of the guns. It is to be supposed that, under these conditions, it will be destroyed before it can inflict damage if it operates during the day. At night it would have greater chance of escape but it would be difficult for it to find its objective.

The aeroplane presents a much smaller target than the dirigible, and would be more difficult to combat, especially at night. On the other hand, its small supply of munitions effectively prevents it from making a determined attack.

The best defence against air-craft at present appears to be the use of other air-craft of both types and of anti-aircraft guns mounted both on shipboard and on land. The second class of attack mentioned above, land attack, will generally be made on a base whose defense is entrusted to a mobile army. The defense will not differ from that of any other place thus attacked, and its discussion is not the object of this article. Suffice it to say that the defense of a naval base against land attack should receive as much care as that of its water front.

There remains to be discussed attack from the sea. The operations which a squadron may conduct against a base are the following: 1st, blockade; 2nd, long range bombardment; 3rd, the attack in force.

The blockade, either of the entire littoral or of the portion of the coast which

COAST DEFENSE—Continued

includes the naval base whose capture or destruction is sought, cannot be held off by siege artillery. This mission requires a new piece of long range and consequently of large caliber.

The long range bombardment likewise requires that the pieces of the defense be on a parity with those of the attack, although this need be no more than in caliber. The need is for a piece which will have the maximum effectiveness at the limiting distances, striking principally on the decks, and a shorter piece will suffice. This will have the advantage of increased life and consequent economy. That it will have less precision than a longer piece need cause no worry, since either would have been sufficient.

The mounts for coast artillery may be arranged to give elevations which are impossible on shipboard. The latter installations have not yet passed 15° although 20° is proposed, while there is nothing to prevent obtaining 30° on shore. With a piece of 45 calibers, this would give an advantage of 4 or 5 kilometers range over one of 50 calibers on shipboard.

The range of large caliber batteries may also be increased by the height of site, which may be as much as 200 meters. This also would increase the protection, the field of view and the remaining velocity and energy.

Coming now to the attack in force, if there are no dead spaces from which the base may be bombarded with impunity, the enemy, convinced that his long range bombardment cannot produce rapid and decisive results, will assign the various targets to his units, concentrate his fire on those which he desires to destroy most quickly, and advance rapidly to the zone of maximum effect. · He must be met by a rapid and dense fire.

This requires a piece which possesses, besides the maximum range above mentioned, great precision and high power. These conditions are fulfilled only by supercalibers. The cost of these pieces is such, however, that the number mounted for the defense of a port will necessarily be small; less than the number carried by a single battleship.

Besides, the rate of fire of these guns will always be slow—one or two shots per gun per minute—the density of fire will consequently be light. Another piece, capable of firing a large number of projectiles charged with high explosive, and at the same time having sufficient power and precision to influence the result of the combat, is therefore necessary. This piece will constitute the medium caliber armament. It must be capable of delivering a projectile at a range of from 12 to 15 kilometers with sufficient energy to cause material damage. This cannot be done by the 15 cm. gun.

In addition to the above, howitzers will be required in order to reach portions of the coast sheltered from gun fire, and thus prevent the enemy from making an easy landing.

The primary armament should be so emplaced as to cover every point in the field of fire with all the pieces, not only in order to secure the maximum efficiency for the defense, but also in order to obtain the maximum power with the minimum number of pieces.

The principal rôle of the secondary armament is to cover the portions of the field of fire not reached by the primary armament and to reinforce the latter at medium ranges.

The anti-aircraft armament, in as great numbers as possible and on as high sites as possible, should reach the enemies' air-craft before they enter their effective zone either for fighting or for observation.

The howitzers should be of large caliber in order to obtain the maximum power. They should be emplaced in as high sites as the terrain permits.

It is not sufficient merely to provide all these elements. There must be a perfected organization, instructed in every detail, in order to secure harmonious operation.

—Organization

[From Harbor Defense to Coast Defense. By Colonel Charles A. Bennett, Coast Artillery Corps. *Jour. U. S. Artill.*, Sept.-Oct., '15. 2000 words.]

The lessons of the European War attract public attention to ways and means of defense against possible attack and invasion from the sea. The large and well trained armies abroad combined with great transport development, constitute a standing menace in view of our small army and the foreign policy which our people demand.

Our harbor defense is immobile and can defend only within the range of its guns. It cannot, of itself, prevent a landing elsewhere on the coast. Hence the necessity for plans for defence by mobile troops.

To land successfully on our coast, an enemy must have command of the sea locally, hence our fleet may assist in the defense of the coast. On the other hand the area of operations for the fleet is wide and it may not be possible to concentrate it in time at the threatened point.

New weapons of warfare have recently appeared, viz., aircraft and submarines, which are admirably adapted to coast defense and will furnish the mobile coast defense we need. The submarine has a great moral effect apart from its actual efficiency, and it is to be anticipated that the offensive power of aircraft will be greatly developed; and as these auxiliaries of the defense operate nearer their bases than do those of an attacking power, their value as weapons will be so much greater to the defense.

A rational organization to meet the requirements of such a mobile defense would consist in:—

(a) Division of the coast line into zones of defense, with bases in designated harbors.

(b) Combination of zones into districts.

(c) Assignment to zones and districts of elements of defense.

(d) Observation of each zone by aircraft.

(e) Patrol of each zone by submarine.

(f) System of wireless communication.

(g) Prompt concentration at any threatened point of all elements of defense, in-

cluding aircraft, submarines, coast guard troops, available naval forces; resources of adjacent zones and districts to be utilized as needed.

The question of command is important, and success in a defense of the nature proposed will involve co-operation between the commander of the zone and the commander of the mobile defense, which should be entirely naval. Future developments may even show the necessity of placing the entire coast defense under the navy department.

—Security and Information Service

[The Service of Security and Information in Coast Defense. By 1st Lieut. William N. Porter, Coast Artillery Corps, U. S. Army. *Jour. U. S. Artill.*, Jan-Feb '15. 5000 words. Illus.]

Because of its great length of coast line, its many foreign possessions, and the fact that naval strategy demands that the fleet seek out and destroy the enemy's fleet, the coasts of the United States must be exposed more or less to hostile attack. Therefore it is incumbent upon the Coast Artillery to provide for an adequate defense of the coast independent of any assistance from the navy.

Coast artillery garrisons cannot be at all times at the guns ready to repel attacks, consequently measures for security and information are essential. The present orders contemplate that the information service shall be furnished by the naval patrol, but on account of the scarcity of naval officers and ships, this service in the light of past experience is liable to break down in time of war. Information to be of use must be furnished promptly to the authority who is to make use of it, and must be transmitted in an intelligible form, so that the coast defense commander may have in advance full details of an impending attack. In view of these facts a coast artillery information service is advocated.

This service should include the following:

1. A coast artillery information division.
2. Wireless stations connecting coast defenses.
3. Scout and patrol vessels at each harbor mouth.
4. Aeroplanes.
5. Coast guard observing stations.

The coast artillery information division should be under the Chief of Coast Artillery with branches at each district headquarters. It should be in close touch with the Navy, and should collect and supply general information to the coast defenses.

Each coast defense should have a radio set of sufficient power to communicate easily with adjacent coast defenses both to the north and to the south.

The harbor patrol boats should be speedy, equipped with radio, and capable of operating at a distance of 50 miles or more from the port to be defended. The Naval Academy graduates in the Coast Artillery might be utilized to command these boats, which might be composed of the obsolete torpedo boats and submarines which now are broken up or sold by the Navy.

Aeroplanes would add considerably to the radius of the information service.

The coast guard observing stations should be prepared and equipped and the personnel therefor trained in time of peace, so that the stations are ready to go into operation upon the outbreak of war.

A service of security is of equal importance to prevent the garrisons from being taken by surprise. At or just before the outbreak of war special precautions must be taken against operations by spies or other hostile secret agents or sympathizers.

The most probable form of naval attack at any period of a war is the torpedo boat raid. For security against such raids, a system should include:

1. Scout boats and patrols equipped with light bombs and at night drawn close in to the mouth of the harbor.

2. Fixed searchlight beams so located as to throw a broad band of light directly across the mouth of the harbor. Fixed beams are considered more suitable for picking up rapidly moving destroyers than are sweeping beams.

3. Eclipsed lights with watchers equipped with Very pistols.

4. Booms and breakwaters in harbors where the conformation of the entrance permits.

Attempts at blocking channels by sinking apparently peaceful vessels therein should be provided against by the establishment of examining anchorages and boats reinforced by a special shore batterv.

Observers, aeroplanes, upward beams from searchlights, and concealed batteries furnish the principal security against overhead attacks.

Due to the constantly increasing power of ships' guns, the zone of defense of the coast fortifications must be extended outward correspondingly. This can be done best by adding coast defense submarines and destroyers to the coast defenses.

—Use of Aeroplanes in

[The Aeroplane in Coast Defense. By 1st Lieut. Samuel H. McLeary, Coast Artillery Corps, U. S. Army. *Jour. U. S. Artill.*, May-June '15. 15,000 words. Tables. Illus.]

In beginning consideration of this subject we first should consider how an attacking fleet would use aeroplanes. Among the most valuable uses are: reconnoitering, assisting submarine operations, attacking with bombs against docks, magazines, ships etc.; carrying dispatches, and observing fire. But of these the most valuable is reconnoitering, since every military operation is based upon information, and by using aeroplanes the fleet commander gets information without exposing his ships to hostile fire. Observation of fire is much facilitated as the fall of shots can be observed readily from aeroplanes, and the longe range bombardment thus becomes more of a menace to coast fortifications.

Defense against aeroplanes consists in concealment, anti-aircraft guns, and combat aeroplanes.

COAST DEFENSE—Continued

In the present stage of the development of bomb attacks by aeroplanes, measures for concealment should look more to concealment from observation than from aerial bombardment. Emplacements should be made to blend with the surrounding landscape by use of shrubs and appropriate coloring.

An increase of the present types of armament will not serve the purposes of anti-aircraft guns. A special gun similar to the Krupp types should be developed. At present the difficulties of effective fire against aircraft are so many that we should not place our sole reliance for defense upon guns alone.

The best defense against hostile aircraft is the possession of aircraft of our own. The necessity for aerial combat is real since in order to carry out its mission, an air-craft fleet first must gain control of the air by defeating the enemy air-craft.

In determining upon the most suitable type of air-craft for coast defense, consideration must be given to the uses to be made of such craft. Kites and balloons may be eliminated and our range of selection is reduced to the aeroplane and the dirigible.

For purposes of strategic reconnaissance, the aeroplane is superior to the dirigible on account of its greater speed, less vulnerability to hostile fire, greater handiness in strong winds and in landing, much smaller cost, smaller storage space required on shore, and in addition because we have good aeroplanes of domestic manufacture.

For purposes of tactical reconnaissance and spotting, the machine must fly low at slow speed, and the aeroplane is deemed more suitable because of the smaller target presented.

Combat requires offensive power and ease of maneuvering. Again the aeroplane is preferred on account of possessing the latter quality to a much higher degree.

To be suitable for reconnaissance and spotting, an aeroplane should have variable speed, should be two-seated, lightly armored to resist fire from small arms, and should carry wireless equipment. A machine gun has been suggested for defense, but dependence upon high speed is considered preferable.

The combat machine should be high powered, capable of carrying considerable weight at high speed, armored, and armed with a machine gun.

Based upon the Signal Corps organization of an aeroplane squadron for an infantry division, each important coast defense should have a squadron of four aeroplanes; and each less important coast defense, a squadron of two. If a greater number than this were needed at some threatened point the additional machines can be transported there readily from other places not threatened.

In conclusion, it must be recognized that the development of aircraft has introduced new conditions into modern warfare, and the following suggestions for improving our coast defenses are made.

1. All batteries, storehouses, and magazines should be screened from overhead observation.

2. Anti-aircraft guns should be installed and should be organized as a special fire command.

3. Anti-aircraft searchlights should be installed.

Observers of the Anti-aircraft Fire Command should be trained to distinguish types of aircraft, in the same manner as observers of other fire commands now are trained to identify types of warships.

—Use of Aeroplanes in

[*Army and Navy Register*, Sept. 18, '15. 600 words.]

Mr. H. A. Wise, Vice President of the Aero Club of America, reports on the subject of an aerial coast guard patrol on the coast of Maine. He recommends the selection of Upper Flag Island in Casco Bay. This bay provides one of the best hiding places for submarines to be found on the coast of New England. Maine is the most easterly state of the U. S., and would be the first to be reached in an attack. The Aero Club of America is working for the establishment of this aerial station.

COLOMBIA, United States of

—Army

[To Whom do We Owe Our Military Reform? By Gen. Gomez Mayorel. *Memorial del Estado Mayor del Ejército de Colombia*, Apr, '15. 2000 words.]

In 1907, the executive power, interpreting a national sentiment. solicited from Chile the first mission of instructors. In the same year, the Military School was founded.

In 1908, the Government founded a School for Officers.

In 1909, the Course of Application.

In 1910, the War College.

In 1911, The General Staff.

Later came compulsory military service.

The reform is due to the efficient action of the Government, supported by the good will of the citizens.

—History

[The Campaign of Thirty Days. *Memorial del Estado Mayor del Ejército de Colombia*, Apr, '15. 1200 words.]

(Correspondence between General Antonio José de Sucre and the President of Perú, concerning a Peace Commission.

Protocol of the Conferences. The Peruvians demanded that the soldiers taken by Bolivar from Perú, after the Battle of Ayacucho, to fill vacancies in the Colombian Army, should be returned and that Perú should be indemnified if, for any reason, they could not be returned. The Conference dissolved without being able to come to an agreement on this matter.)

[The Thirty Days' Campaign. *Memo. del Ejército*, (Colombia), May, '15. 3000 words.]

Correspondence between the President of Peru and General Antonio José de Sucre, commanding the Southern Department of Colombia, exchanging signed copies of the protocol resulting from the conferences of their commissioners February 11 and 12, 1829, and

containing mutual accusations of misrepresentation and bad faith; also a copy of the preliminary treaty of peace dated March 1st, 1829, providing for a reduction of the military forces of North Peru and South Colombia, to a peace footing of 3000 men, arranging for a boundary commission, adjusting public and private debts between the two states and the formation of a defensive alliance against foreign aggression.

In consequence of mutual distrust it is agreed to solicit the United States of North America to guarantee the fulfillment of the stipulations of the treaty.

See also

CORDOBA, GEN. JOSE MARIA

—Military Conditions

[Notes on the Geography of Colombia. *Memorial del Estado Mayor del Ejército de Colombia*, Apr, '15. 3500 words.]

Northern Region.

The northern region, comprising the departments of Panama, Bolivar, the Atlantic, and the Magdalena, is characterized by savannahs of great extent, large ciénagas, few valleys and mountains.

(The author states that Panama will be omitted from the discussion, "because it is now in rebellion.")

On account of its slight elevation above sea-level (almost none at all), the climate is generally hot and humid. The land is generally of calcareous composition, formed by fossils of maritime origin. In sections of slightly greater elevation and in the region watered by the Magdalena River, are found forests of considerable extent.

In the Department of the Magdalena, the Sierra Nevada de Santamarta rises to a height of 5887 meters, and the center of the department is traversed by the Sierra de los Motilones, which is the divide between Lake Maracaibo and the Cesar and Magdalena Rivers. This sierra, which is the eastern spur of the Andes, inclines further to the northeast with the name of Sierra Negra and terminates in the peninsula of la Goajira in the mountains of Oca.

In all this region there are cultivated cacao-trees, tobacco, rice, cocoanuts, coffee, cotton, sugarcane; there are also pasture lands. In the Department of the Magdalena, there are extensive banana plantations, and there is also produced wheat, potatoes, corn, and various other vegetables. On the savannahs, there is a good deal of cattle raising, and, in some sections, a remunerative industry is found in the breeding of horses, sheep and pigs. Manufacturing industries produce sugar, liquors, cheese, hats, cotton cloth, oil, and shoes.

In the Department of the Atlantic is a railroad uniting Barranquilla to the mole of Puerto Colombia, measuring 27 kilometers and a telegraph line to correspond. It runs north and south, perpendicular to the Atlantic coast.

In the Department of Bolivar, there is a railroad uniting Calamar with Cartagena. It is 105 kilometers long and runs almost parallel to the Magdalena River.

In the Department of the Magdalena, a railroad is being built between Santamarta and the Magdalena. 100 kilometers of it are in operation.

Cartagena, the capital of the Department of Bolivar, is situated on a sandy island; it is surrounded by walls averaging 7 meters high by 4 meters thick. This island is separated from the land by the deep and well-sheltered Bay of Cartagena. The channel of Bocachica, by which it is entered, is guarded by two forts of antique armament. (This place is called "Plaza Fuerte," but only for the sake of tradition, for it could only resist heavy artillery fire, and that only if the fortifications were strengthened.) The pópulation of Cartagena is 36,632. Cartagena communicates with Barranquilla by a horseshoe shaped road, and there are roads to other parts of the department, but these are not in good repair.

Barranquilla, in the Department of the Atlantic, has 48,000 inhabitants. It is 1155 kilometers from Bogota, and is situated on the west bank of the Magdalena River, 25 kilometers from its mouth. It is the port from which depart all the steamers that ply in the lower Magdalena. Up to the city, the river has sufficient depth to accommodate such seagoing vesels as are able to penetrate the Bocas de Ceniza

Santamarta, capital of the Department of the Magdalena, has 8348 inhabitants. It is a port on the Caribbean Sea, at the mouth of the Manzanares River. The climate is very hot. The port is sheltered from winds and, at a distance of half a league, rises the morro, which is formed by an island in the midst of the sea; it is crowned by a fortress. Santamarta is 1275 miles from Bogota, by way of Barranquilla. It communicates with Barranquilla by the Ciénaga de Santamarta, by an arm of the Magdalena River and by the rail-

Riohacha, in the Department of the Magdalena, is a seaport of less importance; 5000 inhabitants; distant from Bogota, 1435 kilometers.

The other cities of the northern region lack military importance.

The Magdalena is navigable as far as Neiva, a distance from its mouth of 1265 kilometers. It has a great number of tributaries, many of them navigable. The chief of these is a west branch, the Cauca. There are about 80 boats running on the Magdalena.

The Atrato, which is navigable for 590 kilometers, is 2000 feet wide for 200 kilometers from its mouth. Communication with the Pacific Ocean is possible by going up the Atrato and down the Quito, with portage by Quibdo.

The Sinú is navigable for small boats only and for a short distance. It is characterized by the sinuosity of its course.

The Rancheria is the principal river rising in the Sierra Nevada de Santamarta. It is navigable for a short distance, receives several tributaries and has two mouths.

Eastern Region.

The extent of the frontier is 2270 kilometers. With the exception of one small section of the Sierra, it is of low level (between 100 and 600 meters above sea-level).

COLOMBIA—Continued

Bogota, the capital of the Department of Cundinamarca and of the Republic of Colombia, has 121,500 inhabitants; it is situated at 2611 meters above sea-level.

(There follows an enumeration of the towns in this section and of the means of communication. These are not thought to be of the interest or importance of the northern region.)

"COLUMN TIME"

See

MOBILITY—UNITS OF COMPUTATION OF

COMBAT

See also

AERONAUTICS—COMBAT
CAVALRY—COMBAT
INFANTRY—COMBAT
INITIATIVE—IN COMBAT
TACTICS—OFFENSIVE VS. DEFENSIVE

COMMISSARY

See also

KITCHENS, MILITARY—FIELD RANGES
SUBSISTENCE
SUPPLY AND TRANSPORT

COMMUNICATIONS

See

SECURITY AND INFORMATION
SIGNALLING

COMPASS

See also

PRISMATIC COMPASS

COMPULSORY MILITARY SERVICE

See also

CHILE—COMPULSORY MILITARY SERVICE
EUROPEAN WAR—MILITARY LESSONS OF THE —COMPULSORY MILITARY SERVICE
GREAT BRITAIN — COMPULSORY MILITARY SERVICE
UNITED STATES — COMPULSORY MILITARY SERVICE
URUGUAY—COMPULSORY MILITARY SERVICE

CONCENTRATION CAMPS

See also

EUROPEAN WAR — PRISONERS — CONCENTRATION CAMPS

CORDOBA, Gen. José Maria

[Biographical Notes on General José Maria Cordoba. By Maj. C. Rojas F. *Memorial del Estado Mayor del Ejército de Colombia,* Apr, '15. 4000 words.]

The soldier from whom the regiment of Infantry "Cordoba, No. 7," takes its name, was born in Concepcion, a town in Antiquia, Colombia, in 1799.

Having entered the service of the revolutionists at the age of 16, he rose in grade and was made Lieutenant-Colonel by Bolivar after the famous march over the Andes that terminated in the battle of Boyaca, that ended the Spanish rule in Colombia. Under the orders of General Sucre, he delivered a famous bayonet charge that was decisive at the battle of Pichincha that gave the revolutionists possession of Quito in Ecuador.

During a campaign in the Province of Pasto, which was a Colombian "Vendée," Cordoba became general of brigade.

Quito, temporarily evacuated after the battle of Pichincha, was again won for the revolutionists by Bolivar at the Battle of Junin. He returned to Lima, leaving Sucre to pursue the royalists into Upper Peru. The Spaniards were decisively defeated at Ayacucho, in which action the Division of Cordoba stormed the Andean heights at this order of its general: "Division, arms at discretion. Forward, with the step of conquerors!" For service in this battle, he was made general of division.

He was Minister of War under Bolivar. In 1828, he was sent to put down an insurrection in the province of Pasto; the inhabitants had joined with Peru in war against Colombia.

Cordoba was assassinated by the Dutchman, Rupert Hand, in 1829.

[History of the "Cordoba" Regiment to be continued.]

CORRECTORS (for shrapnel fuse)

See

SHRAPNEL—FUSE—CORRECTORS

CORRESPONDENCE

—Military Instruction by

See

EDUCATION, MILITARY—BY CORRESPONDENCE

COTTON

—Use of in European War

[The War in Europe. NOTE.—*Army & Navy Jour.,* July 3, '15.]

"It is estimated that Germany uses 750,000 bales of cotton annually in the manufacture of explosives, and her complaint of the British embargo is prompted by the fear of a cotton famine rather than by the danger of a scarcity of food. It is reported that to meet this difficulty, the manufacture of cotton goods in Germany after Aug. 1 has been forbidden."

[The war in Europe. *Army & Navy Jour.,* July 24, '15. 150 words.]

From a computation based upon German manufacture of 250,000 rounds of artillery ammunition per day, it results that Germany is using 1,000,000 lbs. of cotton per day, or 730,000 bales of cotton per year in the manufacture of artillery ammunition alone. This does not include small-arms ammunition, naval ammunition, or clothing for the army.

[The War Significance of Cotton. Editorial, *Scient. Amer.,* July 10, '15. 750 words.]

Cotton is the principal ingredient by weight of all smokeless powder, and more cotton is being consumed to-day in Germany for powder manufacture than in all the industrial uses.

The enormous consumption of artillery ammunition has been the surprise of the war, even to the far-seeing German staff. It is stated that 200,000 rounds of 3-inch to 12-inch projectiles were used against the Russian front from Tarnow to Gorlice in a single hour. The best authorities now contend that shock must be produced first by overwhelming artillery fire before infantry can assault.

Due to the immense number of heavy guns used by the Germans, a conservative calculation shows the amount of cotton consumed

will average over four pounds per round. They are producing about 250,000 shells per day, which means a daily consumption of 1,000,000 pounds of cotton. These figures do not include the amount used for small arms for the navy, or that used for clothing for the army. One million pounds per day amount to 730,000 bales per annum, about one-half the total imports in time of peace.

As Germany's reserve supply of powder has undoubtedly been consumed already, it thus appears that her future ability to wage war depends on a regular supply from the United States—her only source of supply, for all other sources are closed.

England is making strenuous efforts to prevent cotton reaching Germany, for if the import can be stopped Germany will be beaten in a year.

Cotton is different from copper, for once cotton is used in manufacture it disappears, while copper can be reworked whenever it can be retrieved. Hence it is cotton starvation, not lack of food, that Germany fears.

[Editorial. *Army & Navy Journal,* Sept. 4, '15. 400 words.]

Cotton is essential in the manufacture of powder, and its exclusion from Germany is one of England's prime objects. It is estimated, however, that Germany has received 900,000 bales of cotton since the war began. This amount has gone mostly through Sweden, with smaller amounts passing through Holland, Norway, and Denmark. The amount is arrived at through amounts imported by the various countries in 1914-15 as compared with the year 1911-12.

COURTS-MARTIAL

—Procedure—Preliminary Investigation

[The Preliminary Investigation of Military Offenses. By "R." *Indisch Militair Tydschrift,* No. 7, July, '15. 4000 words.]

When the case is of such a nature that the Corps Commandant cannot determine at once whether the accused should be tried by court-martial, or under what article the charges be preferred, a committee will be appointed to investigate the case and to furnish him with the required information. This is what is meant by "The Preliminary Investigation." This investigation should be very thorough and establish conclusively:

(a) Whether or not a court-martial offense has been committed.

(b) If so, what the specific offense is and by whom it was committed.

This investigation should bring to light all the details with reference to:

1. The offense itself: under what circumstances it was committed.

2. The offender: his identity, his connection with the offense, and all the details relating thereto. All this must be established by at least two witnesses.

3. The place where the offense took place must be clearly determined.

4. Also the exact time when it took place.

5. The motive must be carefully weighed.

6. The mitigating circumstances, if any, must be thoroughly considered.

As all these details must necessarily determine the nature of the charges and the articles under which the charges are to be preferred, too much emphasis cannot be laid on the importance of this Preliminary Investigation.

COVER, Use of

See
TACTICS—USE OF COVER

DARDANELLES, Operations at the (1915)

[The Dardanelles. By Col. F. N. Maude, C.B. *Contemporary Review,* June, '15. 5000 words.]

Some (English) newspapers having attacked the First Lord of the Admiralty [Mr. Winston Churchill] on account of temporary checks to [Allied] progress, it is worth while to examine the grounds of this attack. The failure to prevent the occupation of Antwerp ceases to be an object of criticism, when it is realized that by the help of the British [7th Division], the Belgian Army was enabled to evacuate Antwerp, and the ten-mile gap between the allied armies before Ypres was closed to the enemy and an overwhelming disaster thus averted. But since then, the failure of our fleet to force the Dardanelles has come up. Was the effort of the fleet a mistake? Many factors must be taken into account in answering this question. In the first place, the German Government had been doing everything in its power to influence in its favor all the kingdoms of the Near East. Clearly a front attack by Russians, French and British on the city in whose interests these nations had too often fought before, would be the best possible rejoinder to German misrepresentation. Next, it was necessary to counteract German misstatements that the peoples of the three principal nations were wearying of the war, and that the British fleet was a negligible factor; it was important to traverse these misstatements, because of the effect such action would have not only in the East, but on the Germans themselves. Any statesman, therefore, would have been justified in ordering the Admiralty to proceed against the Straits, nor was the effort out of proportion to the Allies' available resources, when we take into account the low state of the Turkish Treasury, the lack of technical knowledge in Ottoman workships, and the actual difficulties of mining the Straits themselves by reason of the depth of water and variability of currents. Indeed, had the navy from the outset made a dash for Constantinople, the odds are that that city would have been reached with fewer casualties in ships than have actually been suffered up to the present. However this may be, it is clear that the best possible use to make of relatively out-of-date battleships, not needed in the North Sea Squadron, was to force the door of the Black Sea. And in answer to the accusation that the Government was disseminating its resources, it may be asserted that what was needed at the time was not men, but a certain type of guns and shells, the necessity of which had not been foreseen,

DARDANELLES—Continued

for use in central Europe; whereas, the existing armaments were quite powerful enough to deal with anything the Turks could bring against them, and there were superabundant resources in men. At any rate, to-day Allied forces have got a foothold on the peninsula, and the conditions in the Dardanelles are the most satisfactory that can be imagined. The Turkish garrison of the peninsula is cut off from all considerable reinforcements, it possesses no great supplies of food or ammunition, no permanent works designed to give mutual support. The gist of the whole matter is that whether success comes soon or late, the primary political purpose of the Expedition, to wit, proof that the Great Alliance is unshakable, was achieved by the first shots of the combined fleets.

[Reports on the Bombardment of the Dardanelles, from Current Notes on the European War. Editorial. *Artill. Monatshefte,* Apr., '15. 500 words.]

The bombardment was an operation of the greatest importance both strategically and politically. Its successful completion would mean the collapse of the Turkish offensive, the lifting of the Russian blockade, and the solution of the Balkan situation. The Turks led by competent German officers will keep their forces intact around the Sea of Marmora. The Allies can not afford to fail on account of its effect upon the Orient. Success can be attained only by sending an adequate landing force to support the fleet. More than 150 guns, firing over 2000 projectiles, participated in the bombardment beginning February 19, 1915. The Allied fleet in the course of the bombardment was reinforced by 7 English and 3 French dreadnoughts, giving a combined fleet of 22 large battle ships and 20 torpedo boat destroyers.

Gallipoli Landing

[The Gallipoli Landing. Official Report of Gen. Ian Hamilton. *Weekly Edition London Times,* July 9, '15. 10,000 words.]

(Note.—This report covers the initial landing on the Gallipoli peninsula Apr 25 and the operations to May 5. This abstract is confined to those portions of the report dealing with the landing methods, the topographical conditions, and the character of the defenses.)

The Gallipoli peninsula from its narrowest point, where it is spanned by the fortified lines of Bulair to its extreme point at Cape Helles, is 52 miles long. Near its center it attains its greatest width of 12 miles. From Bulair to Cape Sulva the possible landing points are few and too restricted for serious military movements. The peninsula narrows at the line Gaba Tepe-Kalkmaz Dagh. The three dominating features of the southern portion of the peninsula are (1) Saribair Mountain, 970 feet high with precipitous escarpments and very intricate topography; (2) Kilid Bahr plateau, a natural rampart covering the defenses of the narrows from attack from the Aegean; and (3) Achi Baba, a hill 600 feet high, dominating at long field gun range the toe of the peninsula two miles wide on its south west front. South of Achi Bala the ground is shaped like the bowl of a spoon.

The coast is precipitous and reconnaissance developed six possible landing places near the end of the peninsula,—Y beach opposite Krithia 3 miles from Tekke Point; Camber Beach, east of Sedd el Bahr; X Beach near Tekke Point, V Beach and W Beach on the south west front of the toe of the peninsula; and S Beach at Eski Hissarlik Point. There were in addition two good landing places on either side of Gaba Tepe.

In most of these landing places, trenches and lines of wire entanglement were visible from on board ship. Infantry redoubts and gun emplacements were also suspected, but the extent of the defenses could only be ascertained by practical test.

The plan evolved was a scheme for throwing the whole force ashore as quickly as possible. History offered no precedent of a landing under such difficulties. The beaches were so restricted or so well defended. that it was doubtful if troops could be landed fast enough to maintain themselves against the possible concentration of the enemy. The plan was therefore not only to land simultaneously at as many points as possible, but also to threaten landings at other points as a diversion. The weather was bound to play an important part in the landing, which could not be attempted except when continued fair weather might be expected. Other causes contributed to a delay until the end of April when more favorable weather conditions might be expected. The forces had been embarked without knowledge of the exact nature of the operations which they would be called upon to undertake. When this was determined, a redistribution of the forces became necessary. In the absence of proper facilities near the scene of operations all the transports except those of one brigade and certain other small units were taken to Alexandria to permit of re-loading in accordance with the contemplated plan. (Gen. Hamilton was at Alexandria from March 24 to April 7 in connection with the plans for reloading. This redistribution of troops on the transports was apparently completed about April 20.—Ed.) For the landings except that at V beach, the troops were transferred to the war ships and fleet sweepers in which they were to approach the shore. Each ship towed a number of cutters and other small boats. The landings at S and Y beaches were to be made by surprise at dawn, the landings at V, W, and X beaches at 5:30 a.m., April 25, after a half-hour's bombardment by the fleet. The landings at S and Y beaches were successfully made, but during the day the pressure on the troops at Y beach became so heavy that they were compelled to re-embark on the 26. The landing at W and X beaches were made after bombardment, the troops being taken ashore in consecutive detachments by small boats. The landings at X beach was made with little loss. The defenses at W beach were formidable and consisted of a submerged barbed wire entanglement, a second line of entanglement on the shore, land

mines and sea mines, the whole covered by strong trenches on the high ground overlooking the beach and by machine guns concealed in holes in the cliffs in positions immune from the fire of the fleet. These trenches were in turn dominated by the high ground in rear upon which were two infantry redoubts each protected by barbed wire entanglements and having an additional line of entanglement from these two redoubts to the edge of the cliff near the light house. The landing was here effected with heavy loss.

A novel method of landing was used at V beach. The first detachment (3 companies) was towed ashore in small boats. The main force was to be landed from the collier *River Clyde*, especially prepared with ample openings in her sides by which the men could pass by wide gangplanks onto lighters which the collier had in tow. As soon as the first tows had reached shore, the collier was to be run ashore and the lighters placed in position to form a gangway between the ship and the beach. A battery of machine guns was placed behind a sand bag parapet on the bow of the collier. V beach lay at the foot of an amphitheater like slope, a barbed wire entanglement of unusually strong wire and long barbs lay at the water's edge on the beach. An even stronger entanglement lay part way up the slope, and a third entanglement joined these two. All these were covered by the fire of trenches, in one of which were four pompoms.

The landing from the collier did not work out well. The first boats ashore met a devastating fire, and the boats did not return.

A strong current hindered the placing of the lighters, and the Turkish fire was so strong and accurate that almost every man working on the lighters was hit. Serious delay resulted, but eventually the lighters were placed in position. One company started ashore and the fire was so severe that few reached the beach. As the second company was going ashore, the lighters broke adrift and the end nearest shore drifted into deep water. Many men were drowned trying to swim ashore. Again the lighters were gotten into position, and a third company tried to go ashore. The lighters were by now under shrapnel, pompom, rifle and machine gun fire, and the attempt to land had to be discontinued for a time. When it was resumed, the lighters again drifted into deep water. At this time, between 10 and 11 a.m. about 1000 men had left the collier, and nearly half of them had been killed or wounded. The situation was probably saved by the machine guns on the collier.

Late in the afternoon the attempt was made to work over from W beach and relieve the situation at V beach, but it did not succeed.

24 hours after the disembarkation at V beach began, there were ashore only the survivors of two regiments and of two companies of another regiment. During the day they were able to push forward however and relieve the cramped position.

Subsequently the forces landed at these various points were able to join hands and push back the Turks and gain a secure foothold on the extremity of the Gallipoli peninsula.

[The Landing at "V" Beach, Gallipoli Peninsula. *Sphere*, June 12, '15. 350 words.

A new method of landing troops was used at this point by the British. The collier *River Clyde* with 2200 troops aboard was run aground as high on the beach as possible in the early morning of Apr 25. A chain of lighters was brought into position so as to form a bridge between the bow of the ship and the shore. From three large special ports which had been cut on each side, a plankway connected with the lighter bridge. By these means the troops were able to proceed to a point where they could jump into shallow water and wade ashore. After the landing was effected, the chain of barges was strengthened and improved so as to form a bridge between the deck of the collier and the shore, also used in a manner as a pier. A wire cableway was installed between the collier and the shore to facilitate the unloading of ammunition and supplies. Horses, conveyed across the bay in barges, were also landed on the lighter bridge through special ports cut in the side of the barges.

Gallipoli Landing—Australian Troops

[Australians in Action; Operations at the Dardanelles. By C. E. Bean, ***Australian Mil. Jour.***, July, '15. 8700 words.]

This is an account of the landing of Australian and New Zealand troops, April 25, and the operations to include May 31.

The landing place was a small bay about half-a-mile from point to point. There was a narrow beach from which the ground rose in steep, gravelly ridges to a height of 600 feet, with higher ridges beyond. The ridges were covered with low scrub. On each side of the bay the ridge ended in a knoll. Between 500 and 1000 Turks were said to be holding the ridges but the article does not clearly place or describe their trenches. A hostile battery was two miles to the south and other guns and machine guns among the hills covered the landing place.

The troops were conveyed to the vicinity in transports and warships and divided into two forces; one to seize the ridges and the other to follow an hour later. The initial landing force, an infantry brigade, had been practiced for several weeks in landing from boats. The time of landing was before dawn. The night was fine and the moon set an hour and a half before dawn. The ships then stole in near the shore, took position in two lines and transferred the troops to smaller craft which conveyed them to the beach. The enemy did not open fire until the first boats reached the shore, at 4.11 a. m. As fast as the men landed they rushed up the slopes. Orders were not to fire before daybreak but to use the bayonet. The fire of the enemy seems at first to have been directed at the approaching boats, instead of at the men who had landed, and so the attackers were soon up the nearest slopes, from which they drove the enemy with the bayonet. Losses in the boats were very heavy, one machine gun apparently doing great damage. There seems to have been but little control of the attack;

DARDANELLES—Continued

leaders of companies and platoons took the nearest routes from their landing places to the enemy. Within half-an-hour the brigade had completed its landing and had taken three successive ridges.

There was then comparative calm for an hour, during which some entrenching was done. Hostile reinforcements then arrived and began a heavy attack, which lasted all day. The main body had now arrived and was being landed without other interference than shrapnel fire from the battery two miles away, which was not very effective. As fast as they landed troops were rushed into the firing line on either flank of the covering force. The attack was so heavy that no trenches could be dug; troops merely formed line in the scrub and held on until darkness gave them leisure to dig. Naval vessels silenced the hostile guns whenever they could be located, but, on account of the many ridges and gullies, this was difficult and the troops suffered from shrapnel, especially those in Turkish trenches, of which the enemy had the exact range. One battery fired salvos of four shells twice a minute from 2 p.m. until sundown.

After nightfall the lines were straightened and entrenched. Several charges against the flanks were repulsed with the bayonet, against which the enemy would not stand. Water was sent up in petrol cans on mules and donkeys or by hand. Some confusion was caused by strangers in or near the trenches, who gave orders to the men and managed to get them passed along.

The next morning the enemy again opened with shrapnel, shelling both the trenches and the landing place. The battleship *Queen Elizabeth* now stood off several miles and shelled the enemy with great effect, using shrapnel of nearly a ton's weight. For several days the action consisted of heavy attacks and counter attacks, ground being continuously gained to the front. One charge, by a brigade, covered 1200 yards of ground totally without cover, the greater part of the distance under shrapnel fire. The formation was successive lines of small groups. The artillery engaged that of the enemy as soon as it opened and the losses were comparatively small.

In attacking, the Turks kept in line by means of marching tapes, one tape being seen within 30 yards of the trenches, along which 25 dead were lying.

At the end of a month the action had reached a stage at which the opposing forces were heavily entrenched, at places 10 yards apart, and mining and countermining operations were being carried on actively by both sides.

—Strength of Dardanelles Fortifications

[A Powerful Army Necessary. Formidable Defenses. By a Special Correspondent. *Weekly Edition London Times,* Apr 30, '15. 1200 words.]

Few realized the immense difficulties the fleet had to face. "Nothing has surprised the gunners out here more than the resisting power of the old forts round the Dardanelles." Those at Seddul Bahr and Kume Kale, at the northern and southern entrances to the Dardanelles, were subjected to a terrific bombardment by the combined fleets on February 19, both at long and short range. They were so completely smothered with fire that no one believed a stone or a gun could be left standing. Their fire was, in fact, completely silenced. Yet, when the landing parties were put ashore to examine them, the material damage was found to be comparatively small, although they were mere shambles.

"Many of the guns were still intact, and one 9-in. was actually found loaded. The work of destruction had to be completed by the landing parties, and the forts are now heaps of unoccupied ruins, with their guns lying about at all angles. In like manner the forts at Chanak, on the Asiatic side of the Narrows, and at Kilid Bahr, on the European, together with the batteries known as Nos. 7 and 8 lower down the Straits, were silenced temporarly on March 18, because they were so completely smothered by a tremendous volume of fire that the gunners were driven from the guns to the cover of their bombproof shelters; but in view of experience gained on February 25, the Fleet does not claim to have knocked out many guns in them, and after the disaster to the *Irresistible* and *Ocean* some of the guns were manned again and concentrated a tremendous fire on these unfortunate ships during the work of removing the crews to destroyers."

Besides the seacoast fortifications, there are many other obstacles to overcome. First and foremost, there are the mine fields and floating mines caried down by a 4-knot current. Concealed batteries of heavy howitzers and direct fire guns have been emplaced since the first attack on the outer forts. Field guns and light howitzers are effective against the light vessels engaged in mine sweeping, yet they are carefully concealed and cannot be silenced by the secondary armament of the battleships. If the ground were flat, the task would be much easier. The ground is, however, a jumble of hills and valleys, affording many concealed positions for batteries against which the fleet, even assisted by aeroplanes, has not been able to bring an effective fire. The only way the Straits can be opened is from the land side, and this is a formidable task. The guns of the fleet can cover a landing, but the bulk of the work must be done by the troops unaided.

[The Defenses of Constantinople. By H. Charles Woods. *Scientific American,* July 3, '15. 3000 words. Bird's eye map.]

The modern defenses of Constantinople are in three main groups: the forts on the Dardanelles, those on the Bosporus, and the land defenses, including the Chatalja lines.

The width of the Dardanelles varies from 1300 yards to four miles, and the inner end is 130 miles from Constantinople. A strong current flows constantly from the Sea of Marmora, and when the wind is from the northeast navigation is difficult.

The peninsula of Gallipoli is narrow and rugged, and communications bad. On this strip of land the defenses are practically in four

groups—two forts at the outer entrance, those inside Kilid Bahr, where the strait runs practically northwest and southeast, those just to the north and northeast of Maidos, at the narrowest part of the channel, and the Bulair forts, across the narrowest part of the peninsula, defending it from land attack as well as closing the strait.

The Asiatic coast is lower, and the only defensive position of any importance is Chanak, opposite Kilid Bahr. The defenses on this coast are in three groups—two forts near the outer entrance, those near Chanak, at the narrowest part of the channel, and those near Nagara Point, three and one-half miles above the narrows.

Good results have been obtained by the Allies by using long range indirect fire against the forts at the narrows. One difficulty, however, is that the channel is too narrow to permit a simultaneous bombardment from vessels moving up the straits. A co-operation by the army promises effective results since none of the forts are defended on the land side, and an army in possession of the hills in rear of Maidos and Kilid Bahr could cut off the water supply of most of the forts on the narrows.

There are no such good positions in rear of the forts on the Asiatic side, however, and as a result a land operation against them is more difficult.

The Bosporus is about nineteen miles long, and varies in width from 750 yards to a little over two miles. It resembles a winding river, with a strong current always flowing from the Black Sea.

The elevations on the shores vary, being highest near the Black Sea end.

The defenses are well concealed, and mostly located along the straight reaches of the channel, giving fire for a long distance on any passing vessel. The strength of these defenses is greatly increased by the Chatalja lines, covering the rear. On the other hand, the Asiatic defenses have no rear protection, and might be taken without great difficulty, by landing a force on the coast of the Black Sea.

Constantinople being situated on a peninsula between the Sea of Marmora and the Black Sea, its land protection is not difficult. The defenses consist of the Constantinople lines, across the peninsula about twelve miles out, and the Chatalja lines some twenty-five miles out, the latter forming the principal defense. The Chatalja lines extend from an arm of the Sea of Marmora to lake Derkos Gal, near the Black Sea, a distance of about sixteen miles. The forts occupy a ridge of about 500 feet elevation, and are built in two and three lines.

No trustworthy information has been obtained in recent years of the armament or garrison of any of the defenses of the straits or the inland forts; but it is now estimated that not less than 800,000 men are available for the whole military operations of the empire; and as the European part of the empire is now so small, practically this entire force must be assembled in the vicinity of Constantinople.

DIARIES

—Military Value of

[Diaries. By Maj.-Gen. William H. Carter, U.S.A. *Jour. Military Service Inst., U. S.* 1000 words.]

The importance of the practice of diary writing is great. Officers of the United States Army might, by forming the habit of keeping personal notes and records, and depositing these diaries in the library at West Point, thus form a collection of bibliography of inestimable value.

Facility in literary expression is not necessary for these diaries, their value being in the record of facts while incidents are fresh in the memory. The only work of man that survives is the written or printed record, and a consideration of even those records of latest date is sufficient to convince of that fact.

As illustrating the value of the daily diary, notice the inaccuracies and misconceptions resulting from the writing from memory after the Civil War of narratives of campaigns. Those officers best competent to furnish these records frequently forgot and controversies resulted in after years.

Yet, even though we had not formed this habit, our own times are enriched by journals of rare worth, and the suggestion is made that all officers, whether graduates of the Military Academy or not, adopt the habit of keeping diaries and that these records should be deposited at West Point.

DINITROTOLUENE

See
TRINITROTOLUENE

DIRIGIBLES

[The Limitations of Zeppelins. *Arms and the Man* (from *Engineering*), Sept. 9, '15. 950 words.]

The Zeppelin, in spite of some of its advantages has on the whole proved a failure. It is not so good a ship as the Parseval, which is practically a power-driven balloon, the direct outcome of the study of the captive type. And although the word Zeppelin may be perpetuated as the generic name, progress will take place on Parseval lines. The characteristic feature, so far, is the use of two propellers, each driven by its own motor; under stress both may be driven by either motor. The propeller pitch is adjustable, a feature that adds to the efficiency and trustworthiness of this type of dirigible. By the method of vertical steering, the inconvenience of additional planes is avoided. The whole balloon may be tilted by driving the gas from one end of the bag to the other. This is done by using air ballonets, so constructed, moreover, as to operate safety valves, should the gas pressure become dangerous. The latest Parsevals use motors of 360-400 h. p., developing a speed of 50 miles per hour.

Germany

[Notes on the War in Europe. *Army & Navy Jour.* May 1, 1915.]

Larger Zeppelins, costing $600,000 each, are reported to have been ordered constructed. Two are to be finished each month.

DIRIGIBLES—Continued

The new type of Zeppelin airship is reported to be rounded at the front and to have a sharp tail. The vessel is said to be heavily armed. Three tanks for carrying poisonous gas bombs are slung beneath the gondola, or navigating chamber, and are fitted with a newly invented bomb-dropping apparatus. The new airship has a smaller crew than the ordinary Zeppelin, but her speed is reported to be much greater. Among the crew are men able to make a fresh supply of poisonous gas bombs on the voyage. It was reported that ten airships of the new type were already built (June). Several more were said to be in course of construction.

[The Zeppelin as an Offensive Weapon. *Aeronautics*, June 30, '15.]

The descent of *Z-4* at Luneville in 1913 gave France, and through her, the world at large, fairly accurate information on the subject of Zeppelins.

It had a volume of 20,000 cubic meters, and a lifting capacity of 20 tons. Each of the 180-h.p. Maybach motors weigh about 1000 lbs., and consumed 100 lbs. of fuel per hour, while the weight of the "carcass" of the vessel, without motors, was 31,600 lbs.

The naval 28-ton type weighs 43,300 lbs., and requires four motors of the same weight—1000 lbs. each and carries a crew of at least twenty men.

The *Z-4* had been compelled to jettison 6600 lbs. of ballast to attain a height of 6000 feet, and a 28-ton vessel would have to carry at least 9000 lbs. of sand or water for this purpose. The gross weight of the 28-ton ship (including crew) is calculated to be 64,500 lbs. As the lifting capacity is estimated to be only 62,720 lbs., there is a deficit of about a ton. This effectively disposes of the claim that a Zeppelin can carry five tons of explosives.

However, the vessels are equipped with a series of horizontal fins, and these, with the bottoms of the gondolas and connecting gangways, exert a considerable dynamic force; so that it seems possible to carry probably a ton or a ton and a half of explosives in addition to machine guns and provisions for a 12-hour cruise. But it must be borne in mind that there is sufficient lifting capacity only when the motors are running, and if, for any reason they stop, the vessel must descend or a sufficient amount of ballast must be jettisoned to counterbalance. This is, of course, an impossibility at the beginning of a long voyage.

It is 300 miles, or about 8½ hours run, from the nearest base in Germany to the English coast, and the engines consume in crossing about a ton and a half of fuel. If, then, a ton and a half of explosive is carried, a state of static equilibrium will have been attained by the time the coast is reached. To maintain steerage way, however, the engines must run continuously, at part speed at least. On a recent occasion five hours was the time required by a hostile airship in making a trip of 180 miles, an average speed of 36 m. p. h.

The weight of the explosive bombs usually carried by Zeppelins is 185 lbs., and, in addition they are frequently provided with incendiary bombs weighing 20 lbs. each.

From these figures it is calculated that 14 or 15 explosive bombs and some 20 incendiary ones can be dropped, or, if preferred, 200 incendiary projectiles and 7 or 8 explosives, at a maximum.

This conclusion is verified by the experience of May 10, when 100 incendiary and 4 or 5 explosive bombs were dropped on Southend district, London; and it is fair to assume that the vessel would not have returned home without expending her supply, since there apparently was no other objective.

Italy

[Italy's Air Fleet. By Ladislas d'Orcy. *Flying*, June '15. 1000 words. Tables.]

In 1911 Italy decided to build up a fleet of dirigibles of three types or classes: the small (P=*piccolo*), the medium (M=*messo*) of over 10,000 cubic meters, and the large (G=*grande*) of over 20,000 cubic meters. Several P-ships and one M received a good test in the Turko-Italian War, since which time the fleet has been further developed by the government. The fleet in being now has 12 ships, of which one, the *G-1*, 1914, cubes 40,000 meters, and has a speed of 90 k.p.h. Airship design in Italy is characterized by originality. Thus the *Città di Milano* (13.3) is fitted with a keel that extends below the envelope, and that contains navigation and engine rooms. The propellers are twin, one on each side of the stern. As a result of these arrangements, and of the stream-lining established, a 12,000 cubic meter ship of this type does 70 k. under 170 h.p., while a Parseval of the same type requires 360 h.p. to reach the same speed, and an M type 500 h.p.

United States

[The Navy's New Air Craft. *Aeronautics*, Apr 30, '15. 650 words.]

Four bids have been received for one or two dirigibles, to be of the smallest size serviceable for training and experiment. In general the dirigibles were to be of the non-rigid type, about 175 feet long by 50 high, 35 wide, and to carry a useful load of about 2000 lbs.—After much experimenting, cedar has been found to be the best wood for flying boat construction.

[Dirigibles for the Navy. *Flying*. April, 1915. 3500 words.]

[Articles needed and specifications therefor; not susceptible of condensation.]

[A Dirigible for the Navy. Note, *Scientific American*, June 19, '15. 200 words.]

The Navy Department has ordered a dirigible 175 feet long, 55 feet in height, speed 25 mi. per hour, crew 8 men. It is to be delivered in 4 months at a cost of $45,636.

[Navy Buys Air Ship. *Aeronautics*, May 15, '15. 600 words.]

Contract for Navy's first dirigible has been awarded to Connecticut Air Craft Company at $45,636.25. This ship will carry 8 men, 4 crew, leaving room for 4 student observers,

and is to be 175 ft. long, 55 ft. high, with a gas capacity of 110,000 cu. ft. Her speed is to be 25 m.p.h. and radius of action two hours, which may be doubled by replacing extra men with same weight of gasoline.

—Altitude Records

A new altitude record for a military dirigible balloon was established at Campalto, Italy, Mar. 2, when Capt. Biffi reached a height of 10,763 feet 9 inches with the *M-1*. The dirigible was in the air five hours and forty-five minutes.

—Dirigible Destroyers

[The MacMechen-Kamp Zeppelin Destroyer. *Aeronautics*, May 30, '15. 1000 words. Illus. Diagrs.]

This "destroyer" will bear the same relation to the Zeppelin, as the destroyer of the sea to the dreadnought. A company, $5,000,000 capital, has been formed in England to build these ships, and five are nearly completed. They are 236 feet long, with a maximum diameter of 28 feet, carry two motors, 200 total h.p., are to have a range of 300 miles, with a crew of 4, navigator, gunner, and two engineers. The car forms part of the belly of the ship, to which it is solidly bolted. By a suitable contrivance, ascents and descents may be made without loss of gas, continued in 14 separate compartments. The expected speed is 60 m.p.h., to be maintained 10 hours.

Great Britain

[England. New Dirigibles against Zeppelins. *Revista de Artilharia.* Aug., '15. 150 words.]

It is announced that the British Government has approved the invention of the American inventor, Rutherford Macmechen, for the construction of dirigibles to be used against Zeppelin raids. These new destroyers have the form of a torpedo 70 meters in length. The skeleton is made of strong, flexible wood covered with impermeable cloth, and does not carry the suspended boat. Fourteen sacks or gas bags are enclosed in the frame.

—Use of in European War

[Zeppelin Raids Over England. *Literary Digest*, May 22, '15. 400 words. Map.]

The German press appears to be satisfied with the results of the recent raid, particularly with the demonstration that the mouth of the Tyne, South Shields and Newcastle are not safe from German bombs. The English papers on the other hand ridicule these "operations," and are disposed to treat the matter ironically.

[The Zeppelins in the War. By Henry Woodhouse. *Flying*, July, '15. 500 words. map. Portrait of Warneford.]

The Zeppelin has failed as an intrument of warfare. Even when unmolested by aeroplanes its military performance is nil; thus the 14 raids on England have as results the killing of 24 men, 21 women, 11 children, and the wounding of 138 others. The destruction of a Zeppelin by the British aviator, Warneford. simply confirms views held before the war and proves that an aeroplane, 45-90 m.p.h., can get the better of its bulky antagonist. Hence German Zeppelins have operated entirely at night.

The Zeppelin may be useful in peace as a means of transportation; and possibly in war to attack submarines.

In his attack on the Zeppelin, Warneford is quoted as saying that on seeing the air ship, he flew toward it, and when almost over it, descended to within 15 meters, and dropped six bombs. The sixth struck the envelope "fair and square in the middle. There was instantly a terrible explosion. . . I saw my victim falling to the earth in a cloud of flames and smoke."

[Zeppelin Airships: Their Record in the War. By Claude Grahame-White and Harry Harper. *Fortnightly Review*, Sept., '15. 7500 words.]

Zeppelins are still in the experimental stage, so far frail and vulnerable craft, flying neither high nor fast enough to carry out the offensive operations assigned to them in war. In constructing them, Germany sought to provide herself with aircraft which should carry a heavier load than those of any other nation, and fly for longer distances. Two main tasks were, in the earlier stages of the war assigned to them: (1) strategical reconnaissance both overland and sea; (2) bomb-dropping raids. In the flights undertaken in consequence, they were exposed to artillery fire; to this fire it became evident that these huge airships were highly vulnerable, when flying by day and at low altitudes. As to the losses of Zeppelins suffered during the early stages, accurate data are as yet not available. But it is reasonably certain that on the western front, shortly after the outbreak of hostilities, four were destroyed, three by gunfire, and one by a gale; and it is also clear that several others were lost on the eastern front. If we include naval Zeppelins that disappeared, it is estimated by French experts that in the first five months of the war ten Zeppelins had met with total destruction. Zeppelin pilots made the mistake, as did aviation pilots, of flying too low when under fire. If an aeroplane far smaller that any airship, and moving at far higher speed, was not safe at 6000-8000 feet, the risk may be imagined of a Zeppelin flying over hostile ground at only 2000-2500 feet. Yet this is just what happened in several instances on both fronts. The fact is that on the outbreak of war, the risk of gunfire was dangerously underestimated—it was some time before pilots realised that 2000 feet, the most economical altitude for non-stop, long peace flights, involved destructive risks. But even at much greater altitudes, a Zeppelin is still dangerously exposed: a powerful anti-aircraft gun will throw a shell to a height of approximately 20,000 feet. Nor can a Zeppelin afford to give any of her small margin of lifting power for armor. The disasters incurred by their Zeppelins in the first part of the war compelled the Germans to adopt in its subsequent stages a far too ambitious programme. These machines dis-

DIRIGIBLES—Continued

appeared almost completely from the air during the hours of daylight. The result was they lost much of their value as scouts; and were reduced to night-raiding operations, using the darkness as a cloak for the approach of a coast line or city, and then dropping their bombs as quickly as possible, in order to make off while nightfall covered them. But for the defensive measures of those attacked, Zeppelins might have been formidable engines of destruction. A good illustration under this head is furnished by the attack made on Antwerp in the first month of the war. This came as a surprise, hence the city was not darkened. Moreover as the ship had only a short flight to make before reaching its target, she had been able to take on an exceptional load of heavy bombs. But before these could be effectively released, searchlight detection brought on so heavy a fire, that the ship had to rise from her initial height of 2000 feet to 4000, with the result that her bombs fell at random, so to say, and did no military damage. If to the necessity of avoiding defended positions on the one hand, we add the preventive measure of darkening a city or stretch of coast line on the other, the plight of the Zeppelin becomes still worse, because of the greatly increased difficulties of navigation. Apart from searchlights and guns, defensive aeroplanes may be sent up. Under all these conditions the "sting" has been taken out of Zeppelin attacks, and has forced them to waste bombs on undefended areas, as has been the case in the English raids. These raids of course have accomplished nothing of any military value, and have failed completely in their other purpose, the terrorizing of the countryside.

In the case of the types in hand at the opening of the war, the necessity of flying high, and in long flights, of carrying a heavy load of fuel, limits the power and weight of the bombs carried on board. When a Zeppelin is described as having a radius of action of 1000 miles, fully loaded, a low altitude is implied, i.e., destruction is invited. If a high altitude is imposed, then either the radius of action or the weight of the bombs is reduced. It is but fair to say that Count Zeppelin since the war has striven to increase the weight-carrying power of his airships on long flights at high altitudes. Gunfire apart, what the Zeppelin most dreads is the aeroplane, and this because of its vulnerability. That is, if an aeroplane can succeed in rising above its huge antagonist and then drop a bomb upon the unprotected upper surface, it will probably put it out of action. As between the two types of aircraft the Zeppelin has rather the better of it, in the matter of guns. Further, a Zeppelin can ascend faster than an aeroplane can climb. Experiments made to emplace guns on the upper surface of the Zeppelin, as a defense against aeroplanes, have, it is said, proved unsatisfactory, because the flash of discharge showed a tendency to ignite the hydrogen leaking from the hull. No. 2 naval Zeppelin may have been destroyed in this way. In the matter of offense, what is called for by the Zeppelin, is some long-range semi-automatic gun, using special shell exploding on contact with even a yielding surface like an aeroplane wing. Hostile aircraft could with such a piece be engaged at considerable distances. The problem of taking up the recoil, however, remains so far unsolved.

To sum up, unless the Zeppelin can fly faster, higher, and carry more adequate armament, it stands reduced to impotence in war.

[The War in Europe. Note. *Army & Navy Jour.*, Sept. 4, '15. 200 words.]

The First Lord of the British Admiralty defends withholding from publication details of the Zeppelin raids on the ground that such details would be of assistance to the Germans in making future raids more effective.

[The War in Europe. Note. *Army and Navy Jour.* Oct 2, '15.]

Official announcement chronicles fifteen raids by Zeppelins between Jan 19 and Sept 8, all but one since April 14. Total casualties have been 114 killed and 274 injured.

DISAPPEARING GUNS

See

COAST ARTILLERY—MATERIEL—DISAPPEARING GUNS

DISCIPLINE

[Discipline, Its Necessity and How Obtained. By Major F. C. Marshall, 11th U. S. Cavalry. *National Guard Mag.*, Nov., '15. 3000 words.]

(A lecture delivered to students at Camp of Instruction, Ft. Oglethorpe, Ga. The subjects are necessarily handled in an elementary way. Of interest to those whose duties may bring them into contact with these camps of instruction.)

See also

COURTS-MARTIAL

DISEASE

See also

ASPHYXIATING GASES—PHYSIOLOGICAL EFFECTS OF
BILHARZIOSIS
EUROPEAN WAR—DISEASES IN
SANITARY SERVICE
TYPHUS
VERMIN EXTERMINATION

DOGS

—Sanitary Service

[War Dogs. *Scien. Amer.* May 8, 1915. 75 words.]

Germany possesses 1200 dogs trained to find wounded on the battlefield. The military authorities have called upon owners for 400 more dogs possessing the requisite qualities for this use.

—Training for War and Police Duties

[Practical suggestions for the trainers of dogs for War and Police duties. By Juan S. De Narvaez. *Memo. Estado Mayor* (Colombia), May, '15. 1000 words (to be continued).]

Lodging

A clean bed of straw should be kept in the kennel which should be surrounded by an in-

closure from 4 to 6 metres square. Plenty of air, light and space are necessary and the dog should not be kept tied up.

Food

A soup of bread, rice or other grain seasoned with meat should be given regularly and an abundance of clean, fresh water always available.

Hygiene

The hide should be combed and brushed daily to free it of parasites.

The young dog is subject to many disorders of the skin, intestines and nervous system which usually respond to simple treatment (formulas given), but rabies or serious diseases should be treated by a veterinarian.

Training

The animal should be handled by one person and great kindness and patience are required. The physical qualities and temperament should be studied and the breeding considered. Only simple instruction should be attempted with the young dog, which should however be made to understand that it owes obedience and submission to its master.

DRIFT INDICATORS

—For Aeroplanes

See

AERONAUTICS—DRIFT AND DRIFT INDICATORS

DRILL REGULATIONS

See subhead DRILL REGULATIONS *under* CAVALRY, INFANTRY, etc.

DUM-DUM BULLETS

[Dum-dum Bullets. By E. C. Crassman. *Scien. Amer.* Apr. 17, 1915. 1500 words. Illus.]

The British found that the jacketed small caliber bullet of the modern military rifles would not stop the Afghan hillmen. By removing a portion of the jacket from the nose of the bullet, this difficulty was entirely obviated. Ammunition was so prepared at the Dum-dum Arsenal, hence the name. The use of such bullets in war is forbidden by convention among civilized nations. The French use a solid copper-zinc alloy bullet, incapable of alteration to dum-dum. All other nations use a jacketed bullet, which can be so altered, and this fact will probably always give rise to charges of its use.

[The Revolver Bullet Discussion. *Arms and Explosives.* Mar., '15. 2200 words.]

Some discussion has arisen over the issue to British troops of blunt-nosed revolver bullets. The Germans assert that this bullet causes unnecessary suffering, a view disputed by the War Office, which employed Sir Victor Horsley to make tests to determine whether bullets of this particular pattern had greater expanding tendencies than the conventional pointed form. Sir Victor reported that the bullet is as humane as the ordinary conical bullet, does not expand or flatten easily in the human body, and is not "calculated to cause unnecessary suffering."

The origin of the blunt-nosed bullet is traced to the "man-stopper" bullet intended for use against savages or native tribes The "dum-dum" may be traced to the same origin. The Germans are reported to have shot all prisoners found with the blunt-nosed bullet, and it is said that the Allies have been equally severe with German prisoners in possession of soft-nosed bullets. Although the British bullet was not designed to achieve unpopular ends, it has nevertheless been withdrawn.

[Explosive and Dum-Dum Bullets. M. Meyer de Stadelhofen. *Revue Militaire Suisse.* May, '15. 2500 words. Illust.]

The use of explosive small-arms bullets by the Austro-Hungarian forces in their campaign against the Serbians appears to have been established beyond question in the article of Professor Reiss in the *Revue* for Feb '15. Frequent accusations of a similar use by the Germans in the western theater of war have been made. Although authentic individual instances of such use have been shown to have occurred, it is probable that reports of wounds attributed to dum-dum or explosive bullets have in many cases had their origin in conditions incident to the high velocity of the modern rifle, to injuries caused by bullets that had ricocheted or become otherwise legitimately deformed prior to entrance into the body, or to the natural tendency of the wounded to ascribe something unusual or exceptional to their injuries.

It should be borne in mind that a projectile composed of a soft lead center covered with a thin outer jacket of hard metal, (a type of bullet used by the German, Austrian and English troops) lends itself easily to conversion into a dum-dum bullet by fracture or cutting of the outer jacket; while the reverse is true in case of a projectile, such as the regulation French rifle bullet, composed throughout of a hard and homogeneous metal. Those cases of use of dum-dum bullets by the Germans that appear to be properly established by official reports include the following:

(a) Dum-dum bullets of the type regularly manufactured for use in hunting rifles.

(b) Pistol dum-dum bullets. It should be remembered that each German officer armed with the pistol selects his own weapon and ammunition. Case (b) is therefore relatively unimportant.

(c) Bullets that have been transformed from the regulation rifle bullet into dum-dum bullets by machinery regularly adapted to that purpose. These are of the type most commonly found. It is probable that this transformation was made for use of the ammunition at target ranges where the regulation bullet could not be safely used, but this furnishes no proper excuse for the carelessness or indifference that permitted such ammunition to be forwarded for use at the front.

Careful investigation of many alleged cases of the use of dum-dum bullets by the various armies engaged leads to doubt of their authenticity and to the conclusion that many reported cases of such use, and of the methods supposedly used to convert regulation into dum-dum bullets, are based more upon imagination or ignorance than upon actual facts.

DUM-DUM BULLETS—Continued

The authentic cases of effective use of dum-dum bullets are probably rare and allegations of such practices, save in isolated individual instances, should be accepted with much caution.

[Questionable Bullets in Warfare. *Arms and the Man,* Aug. 5, '15. 1200 words.]

From the outbreak of the war cries and complaints have been heard from both sides of inhuman methods, and not the least of these accusations has been that of the use of explosive bullets.

At the outset it may be stated that cause for suspicion can only exist where the bullet is of a composite character. As every nation but one employs bullets consisting of a hard metal covering over a soft filling, it is thus seen that practically all are open to suspicion if this alone is considered. France is the exception, yet the Germans have made the complaint against them.

The usual formation of a military bullet is a drawn-out envelope of steel, copper, or cupro-nickel, entirely filled with lead. Austria, Bulgaria, and Greece use steel alone for the envelope, Germany, Holland and Turkey use steel coated with cupro-nickel, and Great Britain, Russia, Italy, Belgium, and a great many others use cupro-nickel alone. France uses a solid bullet of copper-zinc, with no separate envelope.

It is conceded that, in certain instances, there may have been deliberate distortion of the bullets, but the danger of jamming, loss of accuracy, etc., are so great as to make such practice very minor. There always will be, however, complaints against the composite bullets.

The term "Dum-dum" came into use during the Afghan campaign. The ordinary service bullet had little stopping power against the Afghans, and effective results could be obtained only by the use of a bullet cut off at the nose to expose the lead filling. This would cause the projectile to expand on striking a resistance, and the name came from the arsenal in India where they were first made. Later a modification of the bullet was in use in the British service, but has long since been discarded. Any apparent deviation from the rule adopted by the civilized nations in regard to these bullets must be due to individual transgression amongst the soldiers, or to some natural cause that can be explained.

As a matter of fact the real cause of complaint rests probably with the latest type of pointed projectiles, of which an American writer recently remarked, when discussing the new American military bullet: "Because the weight is far back, because of its high speed, and because it is easily upset, it proceeds to spin widely . . . when it hits tissue, if not travel sideways like a hog to battle." On the contrary, old pattern bullets, such as the British blunt-nosed 0.303, caused clean holes, without any slashing effect.

The American writer quoted above says further: "I have killed, with a companion, five goats, with five shots from the Army Springfield. Every one died instantly, yet not one was like any other in the effects. One was slashed open alongside as if hit with a giant knife, and his entire internal economy exposed. Another showed no mark either of exit or entrance; another had a slash along the back where the bullet hit, as if he had been struck with a cleaver, but the bullet had not gone in more than enough to break the spine; while still another had a terrific slashing wound of exit in the shoulder."

DUMMY FORTIFICATIONS

See

Fortifications—Field—Dummy works

DUTCH INDIA

See also

Holland—Military Policy of—Defense of Dutch India

—Army

["A Reply to Asymptoot," Concerning the Javanese as a Soldier, By P. A. Van Gheel Gildemeester, Captain of Maréchaussée. *Indisch Militair Tydschrift,* No. 7, July, '15. 1600 words.]

Although not finding fault with Asymptoot for expressing his unfavorable opinion of the Javanese as a soldier, exception is taken to the manner in which that opinion is expressed and also to the data on which his conclusions are based. My experience in the field, covering a period of several years, leads me to entertain a far more favorable opinion of the fighting qualities of the Javanese.

It is true that he often appears in an unfavorable light (1) because too little attention is given by recruiting officers to the selection of desirable material. Many who are unfit for military service are passed, and these are apt to reflect upon or characterize the Javanese soldier generally. (2) Because too little attention is given to the assignment of men to field service. Frequently the most troublesome, the filthiest, and least desirable are sent, instead of those who have had the longest service with their company and who are the most proficient. (3) Because of the insufficient training which they have received.

Let due care be exercised in their selection, let them be thoroughly instructed and trained, let them be assured of the fact that you place confidence in them, and they will invariably prove themselves very desirable and dependable soldiers. I deny the assertion that the Javanese are cowards. My experience with them in the field covers a period of eight years and I could mention a large number of Javanese who, far from showing themselves cowards, have distinguished themselves in an exceptionally meritorious manner. They are, as a rule quiet and unassuming, and they seldom boast of their heroic deeds. I do not mean to say that they are superlative as soldiers, but I do maintain that the unfavorable criticism of "Asymptoot" does them injustice.

—Army—Service Regulations

["The Fifteen Carbines." By Asymptoot. *Indisch Militair Tydschrift,* No. 7, July, '15. 2800 words.]

The Field Regulations for the troops in (Dutch) India prescribe that for any detachment acting independently, the strength must be not less than "fifteen carbines." This requirement is absolute. It is binding under all circumstances. It was adopted because there had been too much carelessness and recklessness in sending out small detachments to quell disturbances, the results of which have often been tragic. Although the principle of this regulation is correct and emphasizes the importance of using all due precaution and insuring safety, it frequently proves to be a great inconvenience as well as a positive hindrance to securing the best results. The provision which makes it absolutely binding leaves no room for the exercise of individual judgment which is so essential in numerous cases. Disorders arising among a primitive, uncivilized people, where the radjas or leaders usually have a small following, do not require a strong force to subdue them. A small patrol is often sufficient to quell such disturbances and yet no fewer than the "fifteen carbines" can be sent because the regulations make this absolutely binding. Frequently reports come simultaneously of two minor disturbances in different parts of the country. For the quelling of either disturbance seven or eight carbines would be sufficient but to send out such a small detachment would be a violation of the regulations, hence there is often a needless delay in settling the trouble. A report comes that a troublesome "Toera" is hiding at a given spot. To send out not fewer than "the fifteen carbines" is apt to create too much publicity or too much of a disturbance, and that which fifteen or twenty would fail to do, could easily be accomplished by six or seven, but this would mean the violation of this absolutely binding regulation. Although correct in principle, this regulation should allow more latitude for the exercise of individual judgment and should therefore be amended.

EAR PROTECTION

—Against Artillery Fire

[Sound Deadeners for Ear Protection. *Arms and Explosives*. Feb., '15. 850 words.]

The Armstrong-Mallock ear defender, formed of hard material, prevents the making of a firm and gastight joint with the air canal. As a diaphragm, provides the necessary airtightness while supposedly vibrating in sympathy with ordinary sounds. Excessive waves of pressure, as caused by gun fire, press the diaphragm until it receives support from fine wire gauge situated a suitable distance away. The Elliott ear protector consists of a celluloid stem with a central hole through which a pin can just be passed. Light rubber washers establish contact with the ear canal; the sealing of the ear thus appears to be only approximate. The perfect ear plug awaits invention. That made of plasticene and sheep's wool appears to be the simplest and at the same time the most effective.

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[Ear Guards for War Noise. *Literary Digest*, Aug. 28, '15, fr. *Science Abstracts*, (London) illus. diag. 450 words.]

It is to-day absolutely necessary to guard the ear in some effective way when near a big gun. Not only those near a gun when fired, but those in the neighborhood of bursting shells, etc., should protect their ears. A device to this end is Mallock's, consisting of a container made of ebonite, across the outer end of which is placed a sensitive diaphragm. Parallel to this, and very near it are two fine wire gauge stops. The diaphragm permits the lightest sound to be heard with but little loss. The violent impact of gunfire, however, brings the diaphragm up against the gauge stops, thus arresting further movement, and checking the injurious increase of pressure.

EDUCATION, MILITARY

See also
AERONAUTICS—INSTRUCTION AND TRAINING
CAVALRY—INSTRUCTION AND TRAINING
COAST ARTILLERY—INSTRUCTION AND TRAINING
DIARIES
FIELD ARTILLERY—INSTRUCTION AND TRAINING
INFANTRY—INSTRUCTION AND TRAINING
LIBRARIES, MILITARY
SANITARY SERVICE—INSTRUCTION AND TRAINING
SCHOOLS, MILITARY
UNITED STATES—COMPULSORY MILITARY SERVICE—INSTRUCTION IN SCHOOLS
VOCABULARY, MILITARY
WIRELESS TELEGRAPHY—INSTRUCTION AND TRAINING

—Advantages of

[Army Training for Citizenship. By Lieut. Donald B. Sanger, 19th U. S. Inf. *Infantry Jour.* Sept.-Oct., '15. 2000 words.]

The basic qualities of military efficiency are the same qualities upon which civic efficiency is founded. The soldier upon discharge is in most cases the richer by two essential qualities,—trained respect for law as such, and initiative. The training and fostering of initiative is an essential characteristic of our military instruction. The individual is trained into a balanced being, physically, mentally, and morally. He learns individual observation and thoroughness, and the value of this course can not be over-estimated. His presence improves any community. He carries with him into civil life three qualities very desirable in a civic way; namely, the power to observe, the power to act upon these observations, and the power to carry this action through to completion. The close association between men in the army tends to instill in a man respect for the rights of others.

His whole career in the army is a development of those characteristics forming the essential of good citizenship; and his worth to a community is a decided asset and worthy of social recognition.

—By Correspondence

[A Sensible Suggestion for a Reserve. By James A. Drain. *Arms and the Man*, Aug. 26, '15. 1000 words.]

In a letter to the Secretary of the National Rifle Association, a suggestion is made by E. P. Edwards, President Schenectady Rifle Club,

EDUCATION, Military—Continued

that the Federal Government make some provision for a correspondence course of military study which could be taken by certain of the employes of the General Electric Co., such a course as might be usefully supplemented by work in summer camps. This course would be for the benefit of men who have not the time available to enable them to enlist in the National Guard.

Such a request suggests a general application of the system of instruction by correspondence courses followed by field instruction. The value of such a system would warrant the necessary expenditure. Qualified men would pass into a reserve and be subject to call in war.

—Camping and Training Grounds

See

SALISBURY PLAINS

—Degrees in

[College Degrees in Military Science. By Lieut. A. W. Gullion, 20th Inf. *Inf. Jour.* Mar.-Apr., 1915. 2000 words; tabs.]

The true function of the military department of colleges is the education of students for volunteer commissions in time of war. The practical way to further this function is to secure more dignity for, and more recognition of, the military course in federal aided schools by instituting a course leading to the degree of B.S. in Military Art. The officer on duty with a college is a member of the faculty, and by the exercise of tact and enthusiasm can readily put this idea into effect. The issuance by the War Department of "Certificates of Eligibility" to the graduates of this course would encourage matriculation, and, in addition, would keep such graduates in touch with the War Department. The military part of the instruction of the proposed course already in effect at the Kentucky State University includes the fundamental subjects, with outside historical study and reading. The course continues progressively during the four years, and it is thought will give better returns for the government aid than any other plan heretofore suggested.

—In Schools and Colleges

[Culver's Scheme for Quick Training High School Boys. *National Guard Mag.*, July, '15. 800 words. Illus.]

The trustees of Culver Military Academy authorized a free camp of military instruction for 200 boys selected from Indiana high schools, from May 10 to May 24, 1915. The academy furnished tentage, subsistence and instruction, so that the only expense to students was that of transportation.

The students were held to strict discipline, and a thorough course of instruction in the rudiments of the military profession was given. This included manual of arms, squad, company and extended order drills, camp cooking, first aid, scouting, entrenchments, signaling, etc. The last day of the camp there was an inspection by Maj.-Gen. Leonard Wood. The experiment demonstrated the value of camps of instruction for high school boys.

[A Brief for Military Education in Our Schools and Colleges. By Lucien Howe, M.D. *Jour. Military Service Inst., U. S.* July-Aug, '15. 3500 words.]

By the term "education" is understood development of the young person in certain essentials, such as health, character, efficiency, and general knowledge.

The introduction of military training to a greater extent in schools would improve health. Spinal curvature especially is a growing menace to thousands of school children, and is due to the neglect of teachers to make children sit and stand correctly. Nearsightedness is another marked defect; slight in some, but nevertheless of great importance. Standardized physical examinations, followed by more or less military training, requiring manly out-of-door recreation in camps, would accomplish far more for the physical welfare of the young than specialized sports such as football, baseball, or rowing. President Hibben of Princeton is quoted as approving strongly the establishment of student camps under the direction of the War Department.

But how could this also be applied to young women? By intelligent physical exercise, and by instruction in physiology, bacteriology of the household, first aid, and nursing—all important aids to the country in time of war.

Dancing, properly directed, singing, especially of patriotic songs, and giving of credits for correct carriage and posture are all recommended.

By devoting a few millions of government money to school inspection and semi-military instruction in schools and camps, giving prizes for marksmanship, etc., the average health of the nation would, in a few years, be vastly increased.

The second essential noted, viz.: character, means, in part, the exercise of self-control and the capacity for self-sacrifice. These elements, taught by all the great religions, are *par excellence* a soldier's virtues.

In this country we have to combat the tendency of the child to make a nuisance of himself in the exercise of the freedom supposed frequently to be essential; and a practical way to eradicate bad manners, rebellion against authority and disregard for others is by military training.

Again, in the matter of efficiency, a military education would teach our college graduates that the qualities of promptness, persistence, exactness, and a sense of order might enable him to earn at first as much as a first class carpenter or a bricklayer. These qualities are as important in a girl as in a boy.

Such a system of training would furnish the country soldiers in time of need, without the necessity of devoting a large part of one's life to professional military work. Statistics in the Bureau of Education show that each year over 400,000 boys leave the grammar schools, and, if military instruction is applied to them, these boys, at the age of fourteen or fifteen, would have better physique and a knowledge of exactness, promptness, and obe-

dience sufficient to make a large part of them acceptable as recruits later.

Thus, by solving the question of education, we, at the same time, partially solve the large question of national defense.

—Instruction in Civics

Chile

[Civic Education in the Army. By Capt. Carlos R. Dinator. *Memorial del Estado Mayor de Chile,* Apr., '15. 4000 words.]

Education in civics forms the basis of good citizenship in all countries. One of the items that inculcates love of country is the study of its history, and in Chile even during the short period of its national existence, glorious and meritorious deeds are numerous. By a study of the past the future course can be shaped.

The education in civics in the schools is insufficient. It is common to find a lack of information in regard to the most important items of the country's history, and, consequently, a lack of knowledge of the duties of a citizen.

Thus it is often that one finds deliberate attempts to avoid military service, and this not infrequently amongst members of the judiciary. From which it appears that a veritable crusade must be undertaken for higher civic education.

It must not be forgotten that the nations which excel in greatness and power, like the United States, England, France, Germany, etc., have always given an intelligent interest to the civic education of their people, even from childhood. And, since 1910, we have noticed an awakening in Chile, due to the organization of boy scouts, which promises the very best results.

Although the army is the most fertile soil for this education, even here it lacks direction uniform in character, though we know that in the barracks men are taught various necessary items of patriotism such as duty to one's country, to the family, and to superiors; respect for ladies and elder people; and regimental history.

The teaching of history in the army has, however, been perfunctory. Instead of assuming the rôle of an instructor, the officer generally reads from texts, and thus destroys the effect of the instruction.

From the above it is seen that civic education in the army is far from satisfactory. It must be understood that those citizens who serve their country in the army should be returned to civil life with a fuller knowledge of their future duties, but unfortunately this is not now the case.

Captains should teach the men of their companies by written themes, carefully thought out, and the work should be given the men preferably during the day, as evening instruction is never so profitable. Especially during winter weather the days can be well utilized. The instruction should not be elective, but compulsory, and under the general direction of higher authority.

Besides the captain and the company officers, other well-instructed junior officers, and even candidates for officers of the reserve, may be utilized. School professors and instructors might also dedicate part of their Saturdays to this work; and if all entered upon their tasks with enthusiasm, the results would be splendid. Here is outlined a scheme of instruction, running through the history, civil and military; the theory and construction of the constitution; the rights and duties of electors and office-holders of the country; religious duties; the necessity for economy; and, in general, every kind of virtue that makes for good citizenship.

This program seems, at first sight, to be too extended, especially for uneducated people; but on inspection will be found not to be so, though a division may be necessary of the uneducated students from those further advanced.

—Methods and equipment—Tactical models

[Artificial Aids to Training. By Maj.-Gen. E. S. May, C.B., C.M.G. *Jour. of the United Service Inst. of India.* Jan., 1915. 3000 words.]

The difficulties encountered by officers in training their commands where facilities for instruction on the ground are lacking. can be obviated by constructing a tactical model. This consists of a wooden box from 6 to 12 feet square and 18 inches deep, set on strong supports to raise its top about 3½ feet from the ground. This box is filled with damp sand, which can be molded to represent various features of the terrain. Seats may be arranged around the box to accommodate spectators and students. This model may be used for imparting instruction in map reading by molding the sand to represent the features of a map of convenient scale. Roads may be represented by tape, woods by sprigs, houses by matchboxes or other contrivances, streams by strips of blue paper. Contours can likewise be indicated in some convenient manner. The piece of country thus reproduced in model form may then be used for tactical instruction, situations being given and estimated, orders written, and troops represented by appropriate blocks moved as on the ground. The model may likewise be used to illustrate lectures on military history, the ground of a battlefield being first reproduced and the troops posted in their appropriate positions. Questions of defilade, setting of trenches, and visibility can be settled directly on the model, better perhaps than could be done on the ground.

EGYPT

—History

[Egypt Under the Khedival Dynasty. Historical Sketch. By Lt.-Gen. F. E. Tyrrell. *United Service Mag.* Apr., 1915. 4000 words.]

ELECTRIC WIRES

—Cutting of

[The Interruption of Conductors Carrying High Tension Electric Currents. By Lieut. Col. Pietro Aliquo-Mazzei, Engineers. *Rivista di Artiglieria e Genio,* Mar '15. 4500 words.]

The electric power lines, now so common, carry very high and dangerous voltages. It may often become necessary in military operations to interrupt these lines; it thus becomes

ELECTRIC WIRES—Continued

desirable to study methods of doing this without undue risk.

Transmission lines often work at 30,000 volts, or even more. The current is sometimes direct, but more often alternating, either monophase or polyphase. The number of conductors is generally two, three or four; the lines are as a rule aerial, of bare copper wire well insulated. Distribution lines are of much lower voltage, usually not exceeding 3000, the current coming from the transmission lines through transformers.

Interruption of Aerial Lines.—The first requisite for safety is that the workman be thoroughly insulated, both from the ground and from the lines. All tools must have insulating handles, and the workmen must have rubber gloves, caps, shoes, knee protectors, etc.

Before attempting to cut the connectors, the section of line selected should be short circuited, either by connecting all the conducting wires together, or by grounding each separately. If a good ground is made, damage may be done to the generator, transformers, or other parts of the plant. A convenient means of making a short circuit is a wire or chain, with a ground rod at one end and a weight at the other; a good ground having been made, the weight is thrown over the conductors so as to wrap the wire around them several times.

A better device is to attach to the ground connection a number of wires, each having at its other end a large metal hook; one of these is caught over each conductor by means of a tool with an insulated handle. Still another plan is to connect the conductors two and two by means of metal V's raised to position on light jointed poles of insulating material.

For the actual cutting of the wires, it is not always possible to get up by the supports. It may be well to have light jointed ladders.

Conductors should be cut simultaneously at both ends of a span, near the supports, to avoid danger from dangling ends if the current should come on again. And in all work on high tension lines, the workmen should keep their bodies and clothing as far as possible from the conductors, to avoid any effects from the capacity of the conductors.

If the lines are so high as to make these methods inconvenient, the supports must of course be cut down by explosives; if the conductors are not all broken, they should be cut with the same precautions as before.

Electrically Charged Entanglements.—Monophase alternating current is generally used in these, with a grounded circuit. The entanglement is divided longitudinally into sections, and a feed wire run irregularly through each. Artillery fire has little effect upon these entanglements, but some damage may be done by hand-grenades of charges of explosives on the ends of poles. Broken conductors in contact with the ground or other conductors cause short circuits and a notable reduction of efficiency. If this is not sufficient, more thorough methods similar to those above described are recommended. Experiments at Pavia in 1912 have led to the development of a special equipment and technique for this, which, of course, cannot be described here.

Electric Railways.—If the conductor is underground, the conduit must be opened and the connection cut. If a third rail is used, two methods are available. The connections between two successive elements of the rail may be cut, or the rail may be grounded. Any of these operations requires protection for the men. Generally, perhaps, it would be better to tear up track.

—Location of Breaks

[To Locate Open Breaks in Single or Multiple Conductor Cable. By 1st Lieut. Clair W. Baird, Coast Artillery Corps, U. S. Army. *Jour. U. S. Artill.*, Jan-Feb, '15. 150 words. Illus.]

Attach the secondary leads of an ordinary spark coil (1", 1½", or 2") to the ends of the conductor at fault. Attach the primary leads of the coil to three or four cells of the storage battery, the cells in series. The break is found by listening along the cable for the crack of the spark as it jumps across the gap caused by the break.

"EMDEN," Operations of the

[The Last Fight of the *Emden*. Anonymous. *Australian Military Journal.* January. 1915. 2500 words.]

The *Emden* aroused suspicion while reconnoitering about Cocos Island, and a wireless message was sent out before the landing party seized the station. This message brought up the *Sydney,* whose speedy arrival forced the *Emden* to a precipitous flight northward.

The *Sydney* closed with the *Emden,* which attempted to shorten the range so that her 4-inch guns could secure the greatest effect. The *Sydney's* 6-inch guns, fewer than the *Edmen's* 4-inch, called for a longer range, which the superior speed of the *Sydney* secured. The *Emden's* first broadside, as well as the reply from the *Sydney,* went overhead. The *Sydney's* next two broadsides struck the *Emden* and burst on the inside. The *Emden's* shooting, which was at the extreme range of her guns, was very rapid and very good. At times she had three salvos in the air at once. During the first ten minutes, hits on the *Sydney* were frequent. The *Emden's* fourth salvo, 5 guns, penetrated the side, throwing the *Sydney's* gunners to the deck.

The *Sydney's* shooting was evidently of a high order also, and the *Emden's* rigging, with its main fire position, was soon shot away. About fifteen minutes after the opening shot, a broadside entered the stern of the *Emden,* destroying her steering gear, tearing off the deck and setting her on fire. The disparity in speed and guns was too great. The *Emden's* salvos were fired at an elevation of 30°. whereas the *Sydney's* broadsides passed through the German vessel horizontally.

The *Emden* continued to fight, but gun after gun ceased fire, smoke poured out on all sides, explosions from within tore off her deck, both remaining funnels fell, and finallv. to prevent

sinking, she was run ashore on North Keeling Island.

The *Sydney* followed a collier standing by, overhauled and scuttled it, and then returned to the *Emden*. For twenty minutes her signals to the latter elicited no response, and only after two broadsides had been fired into the *Emden* was the German flag lowered and the white ensign raised.

The *Sydney* rendered medical aid. Examination of *Emden* showed her to be a mass of tangled steel, the stern unrecognizable, the interior gutted by the broadsides of the *Sydney*. The *Emden's* casualties were 200, the *Sydney's* 15 killed or wounded.

The landing party, 40 men, left on the island when *Emden* attempted flight, escaped.

ENCAMPMENTS

See also

Concentration camps

Mexico—Internment of Mexican troops by U. S. (1914)

ENGINEERS

[Duty, Organization, Training and Equipment of Engineer Troops for Field Service. By Maj. P. S. Bond. Corps of Eng'rs. *Professional Memoirs*. Nov.-Dec., '15. 12,500 words.]

Duty with the mobile army is the prime function of engineer troops, and is the one on which their organization should primarily be based. All other duties,—at bases, on lines of communication, even in siege operations—are more special in nature, and are prescribed by the exigencies of the situation. The engineer troops for field service should be with the combatant forces at the front, subject to the immediate orders of commanding officers. Their work should be characterized by extreme rapidity, utilization of local resources, and a thoroughness merely sufficient for immediate needs. It is extremely important to define sharply the duties of the field engineers, in any actual operations, and not to fritter away their energies on work for which other special troops or civilians are available.

The ideal engineer troops are those prepared to execute all tasks which may be assigned them. We find in many foreign countries a tendency to specialize the work of technical troops. For our service, it is believed that such a policy would result in a needlessly complex and numerous force, many of whom would be idle much of the time. Outside of the duties that fall to the Signal Corps, the remaining technical tasks demanded by the modern army can be adequately performed by a single corps of engineers. For this ideal the engineers of the United States Army are, and should be trained. Mapping work requires no special troops; the organization of special pontoon companies is thought to be unnecessary and unwise. Railroad work, building construction, and siege operations may require the co-operation of a few expert civilians. With existing examples of extensive construction and mapping work successfully performed by our engineers, it is believed they would be found equal to any of the exigencies of a campaign.

The company is essentially the administrative and technical unit of engineer organization. Division of the companies, except by their own officers, is not advisable. The present authorized war strength of a pioneer company, 164 enlisted men, is satisfactory; the number of officers, however, should be from 5 to 7 per company. It is believed there should be in each company several men corresponding to the grade of petty officer in the Navy. These "master pioneers" would perform the duties of foremen or overseers, in directing sections, or working details from other branches; such skilled superintendents would often be worth many untrained men. The personnel of the company should include artisans of many kinds, with plenty of helpers and laborers. There can hardly be too many carpenters; on the other hand, the trades have a tendency to overlap, and not all of them require distinct representatives. Special mention should be made of the cooks, whose importance in promoting health and cheerfulness can scarcely be exaggerated. The pay of the enlisted personnel should be greater than that of the other troops of the line.

The mobility of an engineer company should be increased, when practicable, by relieving the men of their packs. The proposal to deprive the engineers of their rifles is considered inadvisable, as their self-respect and efficiency would be lowered as mere noncombatants. For the rapid execution of special tasks, a mounted section of 24 men is provided in each pioneer company, which seems sufficient to meet ordinary demands of service with foot troops. For the rapid transportation of tools and material for the work of this section, a pack train of six mules per company is prescribed. The need for a standard pack equipment with suitable frames, is very great. Nor has any standard tool wagon, with compartments, been adopted; some officers prefer to carry all tools in the regular army wagon and make issues from piles on the ground.

The engineer officer should be a man of high professional attainments, as soldier and engineer; he should be zealous, resourceful, a good handler of men. Discipline, so important to the efficiency of a company, depends chiefly upon the personal influence of the captain. The men are the tools of the government, placed in his hands; it is his duty to maintain them in good condition, to be a friend and guardian of his men, taking a personal interest in their work and play, sparing them unnecessary hardships. The secret of discipline is to win men's loyalty by getting them on your side.

The alternation of civil and military duties in the training of the engineer officer is thought to be altogether advantageous in stimulating interest and developing engineering knowledge. Young officers should early be placed in positions of responsibility, their ideals of service stimulated, and their sense of proportion developed.

The military engineer—contrary to a belief sometimes entertained—does not disregard the principles of economy. But the economies of civil and military works may differ widely;

ENGINEERS—Continued

in certain military situations any expense may sometimes be justified if it results in a saving of time. Thus military engineering work must often be executed with feverish rapidity. There is no time for niceties at the front; the rough-and-ready makeshift which serves its purpose is the triumph of the engineer's art. In peace training, this prime requisite of speed should by no means be lost sight of. By careful planning of work, by emphasis on competition between parties, by proper organization and superintendence of work, celerity in construction may be promoted.

The training of an engineer company, both individually and collectively, should be varied. It is desirable to develop the "jack-of-all-trades" as well as the "master of one." The company must be thoroughly instructed as infantry, and never be allowed to degenerate into mere laborers. The variety of the engineer's duties promotes interest in the work, and prevents monotony. Whenever possible, works executed for training should serve a useful purpose; all construction work on posts could properly be placed in the hands of the engineers. Co-operation and mutual understanding between the engineers and other branches of the service are necessary for the proper utilization of the former in the field. Hence all should attend maneuvers together.

The equipment of engineers may differ widely with the nature of the locality and the duty. The work of engineers in the field is usually simple in nature, of the rough and ready order; for the performance of this work, an ample number of the simple tools should be provided. Commercial types of tools and materials can be readily obtained in most localities; of special tools and equipment peculiar to the army, on the other hand, there should be at all times an ample reserve supply. [There follows a list of the equipment recommended for general and special purposes].

In the important bridging work of the engineers, the choice of the most suitable type, and the adaptation of the bridge to the site and materials available, are problems requiring considerable skill. There is a strong tendency to put in a bridge, when a reconnaissance would have revealed a practicable ford close at hand. The construction of hasty bridges may often be expedited by carrying with the train several wagon loads of floor chess. The roadway of such a bridge should be no wider than necessary; 8 feet in the clear usually suffices even for wagons.

The regular pontoon equipage, which for wide spans and deep water provides the only type of hasty bridge, should be held concentrated, and not frittered away in small detachments. Its adaptability is very great; and the two classes of material in our service have amply met our requirements for fifty years. In view of the universal adoption of metal floats abroad, further experiments are perhaps advisable on our part; the wooden boats are very heavy and bulky to transport. For the rapid passage of foot troops, a very light portable foot-bridge of the German type merits attention; a good type of flooring would be of a kind of woven material like a Venetian blind, carried in rolls.

Field training is of vastly greater benefit than garrison training. Maneuvers should be periodic and lengthy, and outdoor training should not be neglected even in winter.

—Equipment

[Division Engineer Parks. By Luis Andrade. *Memorial de Ingenieros*, Madrid, Mar., '15. 2500 words.]

The present period of the world's activities is not characterized by the startling application of new inventions, but rather by the application and adaptation of previously known methods of the arts and sciences. In the engineering world even the use of the one element of great possibilities, reinforced concrete, has not recently undergone any new developments, but its use has been limited to the imitation of other materials.

Since, therefore, the art of war is only a product of the application of the other arts, the same condition here obtains; and it is clear that the increased strength of armies, the employment of rapid transit, the application of electricity, the semi-domination of the air and the water, the range of arms, the use of high explosives, and the employment of other modern elements for military purposes, have done nothing more than widen the strategic field.

The Russo-Japanese war, the late Balkan wars, and the present conflict, all confirm this view. The contending parties avail themselves of all the means and combinations of means already known, and those best prepared have greatest success.

Military engineers are charged with the metamorphosis of these various elements, leaving generally, of necessity, to the other arms, the work of immediate application to military purposes.

Since all the matériel that the combatant arms might well use cannot be transported on the field of battle, the problem resolves itself into the selection of those elements most essential, in order not to impair the mobility of troops. Explosives, bridge material, and material for hasty fortifications must be adapted to the means of transport and the terrain. These are carried by the first engineer echelon, leaving to the other echelons the reserve material, to be held as close to the front as circumstances permit. All this matériel must be prepared in time of peace, since it cannot be hurriedly improvised.

The second engineer echelon forms the division park, for the organization of which minute and detailed study is necessary. This echelon must be supplied with tools, repair material, large quantities of wire for entanglements, pickets, etc., for their construction, as well as explosives and other mining material. The rapidity now required in trench building requires machines for excavation, and metal shields are essential for the heads of saps. All these and other elements too numerous to mention are of urgent necessity. Among these are small bombs and hand grenades for trench fighting.

The engineer unit charged with the service of communications is a third echelon.

Grouping the elements into sections, arranged according to importance on the field of battle, we have for the second and third echelons:

1st—Explosives in their various forms.
2d—Accessory defenses.
3d—Advance guard and emergency bridge material.
4th—Illumination train.
5th—Sappers' tools, etc.
6th—Repair material for lines of communication.
7th—Administrative necessities.
8th—General accessories.
9th—Siege train, etc.

The first four belong to the second echelon, and the remainder to the third.

This organization makes the first echelon the combatant unit, the second echelon, accompanying the division impedimenta, the reserve for the first, and the third, a second reserve that can remain if necessary one or two days march behind the fighting line.

—Field operations

[The Engineering Arm in Field Operations (Pt. 1.) By Giovanni Grisola, Captain of Engineers. *Rivista di Artiglieria e Genio*. Jan., 1915. 12,000 words.]

In recent writings on this subject, so much stress has been laid upon the latest developments that it seems that proportions have become somewhat distorted. This essay seeks to give a general picture in true perspective.

The conduct of war is both an art and a science. The arm most distinctly identified with its scientific aspect is that of the engineers. This arm has always been more or less neglected, perhaps because of its lack of picturesque characteristics; but the Italian regulations of 1913 place it in its true position beside the other arms, possibly by reason of its brilliant achievements in the Russo-Japanese war.

The first essential of success is the co-ordination of the arms. Hence officers of engineers and the other arms ought to study each other's problems, and their troops ought constantly to work together. Further, the commanders of the higher units must learn to use their engineers to advantage; neglect of them is costly, as the Austrians found at Sadowa and the Prussians at St. Privat.

But even with the best intentions, superior commanders may be too busily engaged with other matters to plan the use of their engineers. In this case the engineer officers must not remain inactive, but must either act on their own initiative or ask for orders.

The Engineers in Strategic Operations.

Concentration. — Railway transportation is the main element in concentration. No matter how well organized the system may be in peace, emergencies will arise not only within the actual zone of concentration, but everywhere, necessitating new construction and alteration. A glance at the railway work of the Russians in the Orient is sufficient to prove this point. There is also the danger of interference by the enemy, greater than ever since the developments in aeronautics. Another aspect of the same thing is seen in the question of offensive operations against the enemy's railways. All this means engineers, for construction, fortifications, or expeditionary work, in the concentration proper and in strategic reconnaissance and deployment. During the same period, many minor but equally important duties fall to the engineers, such as preparation of equipment, collection of information relative to that of the enemy, construction of depots, water supply and communication systems, etc.

Marches of armies.—Railway lines largely determine the lines of operation of armies, although the substitution of mechanical for animal transport has given them a little more freedom. But whether railways or roads are used, technical troops are needed to keep them in operation.

The Italian regulations provide for general advance guards, backing up the cavalry and preparing the way for the army. These general advance guards require the aid of pontoniers, sappers, miners—all classes of engineers. Mechanical transport helps here, permitting the engineers to keep their equipment well in rear and still get it up when needed. Technical troops are also urgently needed to handle the communications, both from front to rear, and also between separate columns of the main army; and for special reconnaissances, demolitions, temporary fortifications. etc. Excellent illustrations of all these uses are found in the Franco-Prussian war.

Strategic maneuvers.—To secure a preponderance at the decisive point, an army weak in numbers must economize its forces at all other points. Fortifications and other technical works serve to assist the action of our own troops and impede that of the enemy's. Since the direction to be given to the maneuvering masses is of prime importance, all technical means of securing and transmitting information are likewise important, since battle fronts have become so enormously extended. And the services of technical troops are further required to facilitate the movement of these masses in the chosen direction.

Strategic use of cavalry.—All the strategic uses of cavalry require rapid collection and transmission of intelligence, and great mobility of the columns themselves. By the assignment of pontoniers, sappers, miners, telegraphers, automobilists, etc., cavalry masses are made almost independent of the ground and the troops in rear. One of the main causes of the failure of Mistchenko's raid was the lack of mobility, due to the absence of engineers; on the other hand, after the battle of Wörth, the distant reconnaissance of the cavalry of the German Third Army was rendered possible by the aid of the pioneer detachment of the Eleventh Corps. Any engineer troops assigned to the cavalry should, as a matter of course, have motor transport, to shorten their columns and enable them to keep up.

Aircraft save the strength of the cavalry in reconnaissance, but they can never take the place of it even for this duty; the cavalry must

ENGINEERS—Continued

not only find the enemy, but maintain contact at all times and under all conditions.

Another frequent duty of the cavalry is in demolitions. Numerous instances in the Franco-Prussian war show that engineer detachments are necessary to insure this work being done thoroughly.

[The Engineering Arm in Field Operations. By Capt. Giovanni Grisolia, Engineers. *Rivista di Artiglieria e Genio,* Feb '15. 20,000 words. Continued from Jan number; conclusion.]

THE ENGINEERS IN LOGISTIC OPERATIONS

In view of the importance of these operations, full use should be made of all technical means to aid them. Hence it is useful to consider how engineer troops may be utilized.

Marches of large units.

Success in combat depends largely upon the conduct of the marches leading up to it. An important factor in the rate of march is the depth of the column; the number of men and the amount of material constantly increase. but mechanical traction may shorten the column and make it more manageable. This is one service to be expected of technical troops. Another, closely related, is to maintain communication between parts of the column, by motor vehicles and signals. In addition, of course, these troops take care of roads, bridges, etc., and supervise defensive works. If, as already suggested, an engineer officer marches with the advanced cavalry, the chief engineer should have all necessary technical data in time to plan this work properly.

To enable engineer troops to render the required assistance to others, they must not be unduly fatigued by marching. This raises the question of their proper position in the column. Our regulations place the pioneer company at the head of the advance guard, but this normal formation is not always suitable. If too many are at the front, they may easily become involved in the action and diverted from their proper use. It seems best to distribute them according to their probable use: or, in special cases, form special detachments of all arms to escort and assist them.

Quarters.

To preserve the strength of troops for action, every possible comfort should be given them when at rest. The engineers must provide water supply, hospitals, depots, shelter for troops, bakeries, etc.; establish communications, and provide for security. The Japanese engineers in the Russian war are a model; while the troops were reconnoitering and preparing their positions, the engineers were at work in rear, arranging quarters and communications.

Service of Security.

On the march, the engineers of the advance guard remove obstacles, repair and construct roads and bridges, etc. When the enemy is encountered it becomes their duty to open new roads, prepare positions for defense, etc. Occasionally they may be called upon to take part in the action. Aeroplanes at the head of the column may be found useful in near reconnaissance.

Regulations do not provide for engineers in outposts; but occasionally conditions may make them useful there.

Reconnaissance.

Engineers may be employed in any reconnaissance, bringing to the work their special equipment of aircraft, motor cars, etc.; but special technical reconnaissances are of more direct interest to them, determining where and how they may be used to the best advantage. In logistic operations, the results of such reconnaissances may often have a direct influence upon the tactical decisions of the commander. Photography from aircraft may be very useful, as we found in Libya, but wherever possible it should be supplemented by examination from motor cars, since the features of the ground are not clearly enough distinguishable from the air.

Supply and evacuation.

These are the functions of the transport and communication troops, but there is work for engineers at every step. Railways form the chief reliance, and railway work of every possible class is required—constructing, modifying and repairing ordinary track, and laying and operating Decauville and other light lines. Ordinary roads are now beginning to resume their former importance for heavy transport, by reason of motor traction. The necessity of engineers for keeping them in repair is evident.

THE ENGINEERS IN TACTICAL OPERATIONS.

Economy of forces suggests that technical troops ought habitually to be used as such. This does not mean that they are to be considered as non-combatants, as is proved by the losses commonly sustained by them; still, where there is no technical use for them and their assistance in the line is required, they are always available for such duty.

Recent wars indicate the increasing importance of the technical work of engineers on the battlefield itself. Since such pains are taken to conceal troops, there is work for the engineers in planning and constructing cover for their friends and seeking to pierce that of the enemy. The necessity of opening the action at a great distance, and of fighting on a broad front, vastly increases the amount of fortification and communication work. And the increased duration of an action also deeply affects the work of the engineers. It is evident that the attack as well as the defense, has need of them.

The amount of work being so great, of course it is impossible for the engineers to do it all themselves. Ordinary work should be done by the troops requiring it, leaving the engineers for things of more general importance or involving exceptional difficulties. Finally, at the moment of the decisive attack, the engineers should precede the columns and prepare their way.

Fronts being so great, and it being impossible to send orders bv messenger when within effective range, a thoroughly organized system of communication becomes necessary. The extension of fronts also necessitates more

complete reconnaissance, by means of aircraft, since there are so many more unknown quantities involved.

Rapid fire guns and magazine rifles consume so much ammunition that the only solution of the problem of supply is mechanical transport.

Night attacks being more and more necessary, the use of search-lights becomes more common. And the removal of obstacles requires specially trained troops and special equipment.

In regard to the manner of handling engineers troops, it may be said that it is generally not desirable to break up companies to such an extent that the captain cannot retain general supervision.

Near Reconnaissance.

This falls primarily to the cavalry; but modern conditions have rendered it more difficult. The assistance of air craft is essential.

Distant Reconnaissance.

This is the natural complement of near reconnaissance, and the same remarks apply concerning aircraft. Officers of engineers may be called upon to make these reconnaissances, and should be qualified to do so; technical reconnaissances, however, are more in their line. The Japanese, in the Russian war, maintained a special engineer detachment for this purpose. An engineer officer making such a reconnaissance must be acquainted with the intentions of the commander, and must thoroughly understand the tactical use of the other arms.

Mechanism of Command.

To render command at all possible in a modern action, an elaborate system of communication is necessary.

Offensive Action in a Meeting Engagement.

Such an engagement calls for quick collection and transmission of information. Evidently this is another instance of the value of aerial reconnaissance and of signalling systems. The engineers of the advance guard, in particular, will find occasion for all kinds of pioneer work. Our regulations provide for occasional use of the advance guard engineers to assist other troops in combat; but it would seem that this should be exceptional.

Close connection between infantry and artillery is necessary, and engineers may find employment in maintaining it.

Fortifications are now extensively used on the offensive. They will usually be hasty, and executed by the troops who are to use them, but may at times require the assistance of engineers.

Every device should be employed by the engineers to give the general reserves shelter at the point where tactical considerations require them to be posted, provide routes by which they may move readily, and maintain communication.

Defensive Action in a Meeting Engagement.

Such advantages as the defensive has, result from the opportunity it offers to make the best use of the ground; hence the importance of engineer work. There will usually not be time for elaborate work, but this is no reason for not doing thoroughly whatever is possible.

The first duties of the engineers, aside from supervision of defensive works, is in making reconnaissances or furnishing the means for making them; then in providing communications. Information is more important even than on the offensive, and more difficult to get. And even a meeting engagement may last several days, so that search-lights may be needed.

Offensive Action in a Regularly Planned Battle.

The duties of the engineers are the same as in a meeting engagement, but more thorough and extended. One important use is in technical reconnaissances, to determine where and how works should be constructed. Another is in the removal of obstacles. If a position is carried, engineers must be at hand to direct the work of strengthening it against counter attack. Night marches of approach will often be found necessary, and engineers should reconnoiter and prepare the route.

Defensive Action in a Regularly Planned Battle.

The main difference between this and the case of a meeting engagement is that here more time will be available and everything can be done more thoroughly. One point to be remembered is that the assumption of the defensive should imply the resumption of the offensive; the position should be prepared accordingly. Special attention should be given to roads and light railways, for shifting troops and supplies. Signal connections and observation stations are important.

Pursuit.

Aerial reconnaissance may assist in many ways. Dropping bombs may delay the enemy or cause confusion. Engineer detachments may be assigned to the pursuing columns, to remove obstacles and maintain communication.

Retreat.

The essential thing is to gain time; this is evidently a field in which engineers may be useful. Engineer officers should be sent, when retreat seems likely, to arrange for demolitions, clear the roads for the retiring columns, locate and prepare successive positions, etc. In the direction of the enemy, aerial work is useful.

THE ENGINEERS IN COLONIAL WARS

The special characteristics of colonial wars are the wildness of the country and the skill of the enemy in partisan warfare. These characteristics call for the use of engineers. Our Libyan expedition used nearly 6000 engineers, of every class. Their work begins at the very moment of landing, for the equipment generally has to be provided by them. Next, depots, hospitals, water supply—every requirement of the troops has to be improvised. As the column advances, a line of communications has to be constructed if practicable; if not, at least telegraph or signal communication has to be kept open. The amount of work to be done is strikingly shown by a glance at the operations of the engineers in the Libyan expedition.

ENGINEERS—Continued

See also

Barbed wire entanglements
Bridges, Military
Encampments
Entrenchments
Fortifications
Landing operations
River crossings
Siege operations

—Organization

[Organization of Engineers. Major J. E. Craster, R.E. *Royal Engineers' Jour.* Jan '15. 700 words.]

The "single corps" system of organization, under which officers and men are available for any and all duties, is differentiated from the "multiple corps" system, with its separate corps of specialists for pioneering, fortress construction, railways, telegraphs, surveying, etc

A comparison is drawn between the showings made by the two systems in the Chinese operations of the Allies in 1900-01. The separate companies of the Germans are said to have been alternately overworked and idle, without being able to render mutual assistance. The more flexible British system permitted the ready formation of a much-needed additional telegraph section, the co-operation of the sappers and miners on the railroad work, and in general the performance without delay of all work that fell to the engineers. In short, the result is claimed to have been a complete triumph of the "single corps" over the "multiple corps" organization.

Australia

[The Employment of Field Companies. By "Sapper." *Australian Mil. Jour.*, April, '15. 5800 words.]

A field company is divided into headquarters and four sections. Headquarters consists of a major, a captain and 26 men. A section consists of a lieutenant and 42 men and is divided into two squads. The headquarters transport consists of a cook cart, water cart, store wagon and one bicycle. The transport of a section consists of one 4-horse tool wagon, one pack animal, one baggage wagon and eight bicycles. The tool wagon is limbered and can be used as two carts. The front cart carries a lift and force pump, hose, canvas troughing, demolition equipment, lashings, etc. The rear cart carries cutting and entrenching tools. The headquarters wagon carries tools for constuction work, etc. Bridging equipment is not carried by the company but in the train. All officers are mounted.

In considering the proper uses for engineer troops, it should be realized that the sapper is trained as an infantryman as well as in technical subjects. With this in mind it should not be difficult to find a place for him in the scheme of operations. If the sapper is to be of any use as such, he must be early on the ground and know as early as possible what he has to do. Consequently, the commander of the engineers should accompany the staff, leaving the company under the second in command. He will then be enabled to learn what he is to do in time to arrange for the disposition of his personnel and tools upon arrival.

On the march the vanguard should be accompanied by a lieutenant and party of cyclists for the purpose of making the engineer reconnaissance. A section should be attached to the advance guard, not only to facilitate the march but, upon halting, to assist the outposts in preparing for defense and to make preliminary arrangements for the water supply, etc., of the main body. The portions of the field companies not with the advance guard usually march near the heads of their own divisions.

In the attack, the work of the engineers may be of the following nature: 1. Assist in crossing streams. Tactically, it may be desirable to cross at points that are difficult or impossible, so, in order to combine tactical and engineering requirements, the engineer officer should take part in the reconnaissance. 2. Strengthening ground won. Time is the essential factor and the engineer officer should see that his tools are so allotted as best to supplement those of the infantry. Obstacles will not be constructed, as they would be disastrous to the firing line if forced back. 3. Improving communications. Engineers will be of especial value where the front line is entrenched at night and reserves are brought up. Also in the preparation for siting of trenches before dusk, so that working parties may be extended after dark. 4. Removing obstacles. The normal obstacle will be wire entanglements and they may be overcome by clearing a passage with explosives, cutting wires or pulling away a length with grapnels. 5. Fighting when required. Engineers should take part in the final assault. When the main position has been taken the engineers should assist in strengthening it against counter assault and should improve its communications. If the position be on the slope of a hill facing the attack, fresh works must be thrown up on the opposite side of the hill to repel counter attacks, the enemy's former position being used for reserves.

Each tactical point to be attacked will probably constitute a distinct engagement, and the proper distribution of engineers can best be determined by preliminary reconnaissance.

For defence, works will be constructed by the troops that are to occupy them, but engineers should assist where technical knowledge is required. Company organizations should be adhered to and the men not detailed for haphazard work. Certain localities of special tactical importance will form pivots upon which the defence will hinge and certain troops will be assigned to hold them. Engineers will be attached to these commands and their senior officer will act in an advisory capacity to the pivot commander.

In retreat, the engineers should be divided between the advance and rear guards. Those with the advance guard will prepare rallying positions and perform the preliminary work of demolitions, blocking roads, etc. Those with the rear guard will complete the work.

(Note: This article does not treat of the use of engineers in the class of warfare now being carried on in France and Belgium.)

ENLISTMENT

See

RECRUITING

ENTRENCHMENTS

[Field Fortifications in Battle. By. Capt. T. E. Morrison, R.C.E. *Canadian Military Gazette*. Feb. 23, 1915. 2000 words.]

(NOTE.—Most of this article follows standard practice. Only the new points brought out by the experience in Europe are noted.)

Shallow trenches are worse than useless. All work should be toward a narrow, deep trench. Cover from behind is almost as essential as from the front, on account of the "backlash" from high-explosive shell. Earth in the parapet and parados is kept at about equal height, well spread to give thick and inconspicuous parapet. An elbow rest is not necessary.

Three hundred yards is sufficient foreground. Concealment is of the utmost importance. Head and overhead cover are not ordinarily advisable, on account of the difficulty of concealment. If the trenches have been located by the enemy, inconspicuous head and overhead cover should be constructed.

Flanks of intrenched positions should be echeloned and not curved back, to protect against enfilade.

Obstacles should be strongly built and carefully concealed. Stakes of barbed wire entanglements should be painted to match the surroundings, or covered with green twigs or branches.

[Spade Work in the Present War. *Army & Navy Jour.*, June 12, '15. 700 words.]

(Note.—This article consists of comments on "The British Army" by W. G. Clifford, published by A. and C. Black, London.)

Trenches in use in former wars were insignificant compared with the present development in the European War, where trenches have become veritable under surface forts. In many ways the new field fortifications are better than permanent fortifications. The latter can be battered to pieces by heavy howitzers, but the trenches are difficult to locate, more difficult still to hit, and easily repaired or dug afresh if damaged locally. The trenches are irregular in trace, and traversed to localize the effect of artillery fire and to prevent enfilade.

[Trench Warfare. By Capt. W. D. A. Anderson, Corps of Engineers, U. S. Army. *Scientific American*, July 3, '15. 2500 words. Photos and diag.]

Changes in tactics, due to artillery developments in the present war, have compelled armies to go underground to prevent annihilation.

The shattering power of high explosive shells now causes the utilization of sand and earth as far as possible in place of stone or concrete, so that, after an explosion, the defensive mound falls back more or less into its original place.

Prolonged bombardment will destroy any trench, and the soldier finds himself engaged in constant earth construction and digging to repair the damage and build new defenses; so much so that for ten hours' work in building trenches he probably uses his rifle ten minutes.

In planning trenches they are so laid out that if one is captured another succeeding one can be held.

The artillery is located on reverse slopes far in the rear, and the artillery gunner does not see his target. Close contact is maintained by the infantry, who utilize deep, narrow trenches, provided with overhead protection when possible, and covered in front by barbed wire or other obstacles. Guards are ready to man the trenches at a moment's notice. Communicating trenches and provisions for comfort and sanitation are made.

In defensive trenches the maximum of defensive arrangements is provided, so that a minimum guard can hold them. In rear are the reserves in other trenches.

On the aggressive, batteries in well concealed positions concentrate their fire on the points selected for attack and after destroying the enemy's works the infantry, which in the meantime has gathered in the most advanced trenches, rushes forward, under cover of constant artillery fire, either *en masse* or in small groups.

Enormous quantities of artillery ammunition must be expended and the fire kept up until the infantry has reached a point not greater than 300 to 400 yards from the enemy's position.

Advantages are gained only a step at a time, and only a long series of short gains will finally have important strategic results.

See also

FORTIFICATIONS—FIELD

PERISCOPES—FOR TRENCH FIRING

—Defensive Positions

[Defensive Position in Face of Superior Attacking Force. From Supplementary Instruction in Field Training for the Use of the British Army, 1915. Furnished by Captain F. W. Fonda, U. S. Army, Retired. *Infantry* Jour., May-June, '15. Diagram. 2000 words.]

The following lessons learned and changes made are the result of observation along the western line of battle in Europe.

When possible, trenches must be sited so that they are not under artillery observation. This is more important than an extensive field of fire. 100 yards width for the latter is satisfactory, if it cannot be increased without sacrificing concealment. All obstacles must be concealed, as they make excellent ranging points.

For the earlier stages of an attack, trenches are best concealed when placed behind a slight rise, or behind a second hedge with obstacles hidden in a hedge in front.

Field defenses must be constructed to afford protection against shrapnel, against high explosive shell, and against artillery observation by the enemy. This requirement is met by constructing three parallel lines of trench connected by traversed or zigzag passages. The front or fire trench is as narrow as pos-

ENTRENCHMENTS—Continued

sible (18") and 3' or more deep, recessed and traversed when time permits. 15 yards in rear of the firing trench is the communicating trench, 18" to 24" wide and 6' to 7' deep. 25 yards in rear of the communicating trench is the cover trench, 2' wide and as deep as possible—as much as 16' deep in some cases.

Very little assistance can be given to an adjacent sector during an attack, so trenches should be arranged to give as much frontal fire as possible.

Excavated earth is scattered, spread and sodded, or used to make dummy trenches. A rear parapet is necessary to protect against the back blast of high explosive shell, but it must not render the trench conspicuous. No elbow rests are constructed—the individual soldier will attend to that. A simple scheme must be devised for proper direction and elevation of rifles during night attacks. All recesses under parapets must be shored up.

In the firing trenches, head and overhead cover are ordinarily impossible except for observation stations. The rifle and bayonet can not be used to advantage in such a trench. If head cover can be constructed to advantage, a continuous loop-hole is best.

The cover for reserves depends upon the distance in rear of the firing line, ability of the hostile artillery to search the ground, and the possibility of aerial reconnaissance.

The *point d' appui* is unpopular. Straight trenches are preferred, since flanking fire is not to be relied upon. If the flanks of a position are drawn back, this should be accomplished by echeloning the trenches, in order to avoid enfilade fire.

Dressing stations and latrines are constructed in the cover trench. Machine guns are best placed on the flanks of a position, and under cover if possible. They should not be unmasked too soon, to avoid premature destruction by the artillery.

A wood should be held at its forward edge or close in front, with strong overhead protection against falling trees.

Obstacles must be provided. Barbed wire, especially if well concealed, is most efficacious. Concealed, it can be repaired at night, a most difficult task when the trenches are close to the enemy. Standard high and low wire entanglements cannot be constructed. Driving stakes close to the enemy is out of the question. Horses made of branches of trees are fabricated in the trenches and carried out and anchored at night. A construction of limbs of trees arranged radially is also used. Simple flare lights of long life, shielded on the defender's side, should be used.

The following notes from the diaries of airmen are of value:

1. A long line of trench is more clearly visible than groups of trenches.
2. Straight trenches are conspicuous.
3. Trenches across ploughed fields are easily distinguished.
4. Straw spread at the bottom of trenches is conspicuous.
5. Trenches against hedges are invisible.
6. It is difficult to tell whether trenches are occupied or not. This applies also to gun emplacements.
7. Tracks to gun emplacements are easily visible, consequently tracks must be made to dummy emplacements.
8. Trenches should be covered with brush wood to hide deep shadows at the bottom.

—Machine Digging

[Digging Battlefield Trenches by Machine. *Scientific American*, July 24, '15. 250 words.]

Two powerful American trench diggers have been operated by the Canadian forces on the battle front in Europe and are a great success. Seven miles of trench five and one-half feet deep with a two-foot bottom were dug in ten days.

—Tactics

[British Trenches. *Army & Navy Register*, June 19, '15. *Broad Arrow*, Mar 12, '15. 500 words.]

After describing the system of signs and guide posts, made necessary by the intricacies of the trenches, the article remarks that:— Many attacks undertaken by both sides have for their purpose the capture of rising ground, whence observation of the other side is possible. In respect of infantry a commanding position with a wide field of fire is the last thing desired, but for artillery action such a position is of the utmost importance. These conditions explain much of the fighting that has taken place. So important has artillery fire become that it is almost true in many cases that infantry are more used as a screen for the guns, than in any other way.

See
TACTICS—OFFENSIVE VS DEFENSIVE

EQUITATION

[Seats and Hands. By Bey Coleman Nockolds, 1st Cav. *Jour. U. S. Cav. Assn.* Apr., 1915. 1400 words.]

[A detailed description of the means suited to acquisition of a good seat and good hand mounted. Discusses equipment, "aids" for man and horse, details of proper seat, distribution of rider's weight, use of stirrups, posting, use of legs to apply "aids," handling of reins, use of voice, punishment, etc.]

[Equitation as a Factor of Military Education. By Captain Francesco Ramponi. *Rivista di Cavalleria*, Apr., '15. 3600 words.]

The psychological object of all military training and education is to make a fighter out of a man. Aptitude in strategy, ability in tactics, accurate knowledge of logistics, profound technical study are not so important as the personal victory over that most powerful of human instincts, self-preservation. Boldness, quickness of decision, self-control, determination and

above all knowing how to make oneself obeyed are military attributes that are met with in the practise of equitation.

That equitation has always had a psychological effect on mankind is shown by the proud bearing of the statues representing young esquires of the middle ages, by the refinement and elegance of the followers of the *haute école;* and even in the land of the "strenuous life" by the acclamations of the awards for the winners of horse races.

Gustavus Le Bon, the great psychologist has treated of the psychological relation of a horse and his rider. One has only to read his work to be convinced that riding is more than a muscular exercise of the legs. Proper control of a mount does not depend on muscular force any more than it does on the technical niceties of those who seek to transform the art of riding into an abstract and complicated science. Anyone not lacking a proper seat and the knowledge of that conventional language that man has invented to converse with horses, can succeed, provided he can with his own will dominate that of his mount in a manner identical to that which a wild animal trainer uses to master his wild beasts. A prolonged study of this faculty shows that it depends mainly on the character of the rider and is greatest in him who possesses coolness, self-reliance, perseverance, quickness of decision and determination. Experience proves that this faculty, in some a natural gift, can also be acquired by equitation.

All the great captains, Hannibal, Cæsar, Napoleon and Garibaldi have been remarkable horsemen possessing that suggestive power necessary to dominate not only their brute mounts but the military masses under them, whom psychologists like Le Bon and Spencer claim to be composed of individuals, who have lost their individualities and been merged into the brute mob.

The horse is not a mere gymnastic machine but is possessed of a will and mind which must be dominated by the rider. He is a stern judge of the riders' use of the aids and often expresses a just opinion by policing the rider in the tan bark, convincing him of his error in a more convincing way than any word of his master could.

The equitation necessary to bring out the best results is not that of the jogging country parson nor even that of the bronco-buster. What is needed is a rational exercise, bold without being rash, fatiguing yet without exhaustion, persevering and methodical. These qualities are admirably met by the "natural equitation" of the late Captain Caprilli which has been incorporated into our cavalry regulations. The results have been truly marvelous. But in Italy there are two great prejudices to be overcome before equitation can make proper progress; first, the great distaste of Italians for any kind of physical exercise and second, the fear of hurting their horses by overwork.

See also
CAVALRY—INSTRUCTION AND TRAINING
JUMPING

EUROPEAN WAR

[*Note, for a rapid survey of the material under* EUROPEAN WAR, *that it is distributed on the pages indicated under the following geographical and subject subheads:*

[Belligerent Views of the War's Duration. *Literary Digest*, May 1, '15. 4000 words.]

The *Literary Digest* has written to the editor of every important paper in France, Germany, Russia and England, asking for their views on the length of the war and on the probable terms of peace. In general, the answer is that the war will end when the enemy is utterly destroyed. A long campaign is anticipated. In Germany there is a disinclination to discuss the subject. One German editor takes the opportunity to reproach America for its sale of munitions of war. Any discussion of the terms of peace is inopportune, according to one German editor "because Germany has not reached her military goal, and it is impossible to know what new territory Germany would acquire and can hold without too great a responsibility." No answers have been received from Austria. The French like the Germans are unable to fix a date for the termination of the war. The lost provinces must be regained, Belgium restored to material prosperity, and Prussian militarism broken. One paper, however, predicts peace at Christmas, and still another towards the end of October. Russia says that peace will be made only after final victory over Germanism. The English newspapers do not hesitate to set a more or less definite date. At Lloyd's the betting in respect of the end of the war runs as follows: Before Sept 1. even; before Dec 1, ten to one on; before March 1, 1916. fifteen to one on. No English paper of importance has the slightest doubt of the final suc-

cess of the Allied arms and the same opinion is reflected in the Irish, Scottish and Welsh press.

[History of the European War. *Literary Digest,* May 29, '15. 4000 words.]

[A chronology of the war from June 28, 1914, to May 7, 1915, under the following heads: Austro-Serbian quarrel; mobilization, Declaration and Invasion; Autumn Campaigns; Eastern maneuvers and the Entrance of Turkey; the winter deadlock in the West; the Spring Campaigns.]

[War Notes. By Capt. H. M. Johnston, R.E. (retired). *United Service Mag.* Apr., '15. 4000 words.]

A discussion of current events in the present war.

[A Year of War—and After. By W. F. Johnson. *Independent,* Aug. 2, '15. Tables and maps.]

(Note.—This article gives a good summary of the results of the first year of the war. The principal events are given in a chronological summary. A bird's eye map shows the maximum German advance in France, Sept. 6, 1914, and the present position of the lines. A table of losses is given as reported by official statistics and relief organizations, the principal beligerent losses being:

	Killed	Wounded	Prisoners and Missing	Total
Russia	800,000	2,000,000	800,000	3,600,000
France	450,000	800,000	310,000	1,560,000
Gt. Britain ...	125,000	250,000	90,000	465,000
Germany	500,000	900,000	250,000	1,650,000
Aust. Hung. ..	355,000	800,000	200,000	1,355,000

A geographical table shows the progress of invasion, and shows that the Germans have held 20,000 square miles of foreign territory on the Western front since Oct. 1, 1914. On the eastern front the Russian occupation of enemy territory reached a maximum of 40,000 sq. miles in April, 1915, and at the end of July this had been reduced to about 5,000 sq. mi. The enemy territory held by the Teutonic allies on the eastern front has fluctuated sightly but has been generally increasing and has (July 31) reached a maximum of 40,000 sq. mi. Four maps show the situation of the lines on the eastern front at different dates—Aug. 15, Oct. 15, Apr. 15, and July 31. Tables are given showing number of trained men on both sides (Allies 2,000,000, Germany, Austria and Turkey, 7,000,000) and the cost of the war to the countries engaged.)

[Summing up a Year of Slaughter. *Literary Digest,* Aug. 14 ,'15. 2800 words.]

The close of the first year of the war finds all belligerents determined to prosecute the war to a conclusion satisfactory to themselves. The advantage on land rests with Germany and Austria, though Germany has been stripped of her colonies; on the sea, the advantage rests with the Allies.

Four great campaigns have been carried out. In the first Germany, operating through Belgium, was successful until the wave of invasion broke at the Marne. The second, Russia's offensive against Austria, was beaten by Germany's ability to reinforce Austria, and by the superiority of the German troops. The third, comprising all the offensive efforts of the Allies in France and Flanders, failed against the German intrenched lines, with great losses to the French. A contributing cause of failure was the inability of the British to get up men and to supply munitions. The fourth, the great drive of Germany and Austria against Russia, proves the great resources of the Teutonic nations in men and munitions and gives a solid foundation for their hopes of success. Views as to the present status vary with the sympathies and viewpoint of those expressing these views.

Views also vary as to the effect upon conditions in Europe of various possible outcomes of the war. To those who believe that a lasting peace can result only from a crushing victory of one or the other group of belligerents, it is pointed out that the Napoleonic campaigns and the Franco-Prussian war lacked nothing in conclusiveness, but did not yield permanent results in peace, while the inconclusive wars—England-United States and Japan-Russia—seem to have left no seeds of future strife. "However the present war may end, it will leave no nation gloating over an easy victory."

As for the military lessons, the old kind of warfare has been waged only on the Eastern front. The West and the Dardanelles have resulted in a trench warfare of deadly nature. It has yet to be demonstrated that either side can break such a line except at a cost in lives no nation is willing to pay. Zeppelins have failed to come up to expectations, while the aeroplane has proved important as a scouting adjunct. A new science of concealment from overhead has sprung up, and old weapons of the bomb and hand-grenade type have been again brought into prominence. The early performance of the Austrian 42 cm. gun has not been equaled of late, due to changed conditions. The greatest technical triumph is the submarine.

The losses and the financial strain have been terrific,—so great that wars in the future may be prevented by a knowledge of the tremendous sacrifice involved in modern war.

[The War: Military Notes by J. D. F. *Journal of the Royal United Service Institution,* pp. 241 to 275. Vol. LX, No. 439, Aug., '15. 20,000 words.]

In this volume, the military operations are covered in 12 sections and appendices as follows:

II.	Dates of Declaration of War, (addtl.)
III.	The Armies of the Different Nations. (addtl.)
IV.	The Theatre of War, (addtl.)
V.	Plans of Campaign, (addtl.)
XI.	The Early Operations in East Prussia from Aug. 1 to Oct. 9, 1914.
XII.	The Turkish Operations Against Egypt from Nov. 4, 1914 to Feb. 8, 1915.
XIII.	The Campaigns in Serbia, from July 28, 1914 to Dec. 16, 1914.

EUROPEAN WAR—Continued

XIV. The Campaign in South Poland and Galicia from Aug. 10 to Sept. 30, 1914.

XV. The First Austro-German Operations against Warsaw from Oct. 2 to Nov. 13, 1914.

XVI. The Second German Operations against Warsaw from Nov. 13 to Dec. 25, 1914.

XVII. The Second Campaign in South Poland and Galicia from Nov. 9 to Dec. 25, 1914.

XVIII. The Operations in the Caucasus and Northeast Asia Minor from Nov. 2, 1914, to July 10, 1915.

Appendix III. Despatch from the Field Marshal, Commanding-in-Chief the British Forces, dated Nov. 20, 1914.

Appendix IV. Ditto, dated Dec. 5, 1914.

[The War on Land. By a Military Officer. *The Army and Navy Gazette*. Sept. 25, '15. 1800 words.]

Western Front. The exploit of the French aviators who flew alongside a German troop train, on German territory, and assailed the occupants with machine gun fire may be considered as something unique. The fact that the troops were quite unprovided with ammunition shows that there was a sense of absolute security, and the rude awakening must have had considerable moral effect.

Gallipoli Peninsula. Little information published of late, but the casualty lists show that the fighting continues with much severity. Approaching winter and the influence of the weather on the difficult operation of landing troops and supplies, and embarking sick and wounded on a coast the shores of which are totally unprovided with any facilities for so doing, must be exercising the minds of the naval and military staffs. The rainfall is tropical in its intensity, and the difficulty of keeping the trenches and dugouts habitable entails enormous drainage work, and the health of troops is likely to be seriously affected by climatic conditions.

On the Eastern Front: With reference to the Vilna raid, it may be presumed that it was made largely by cavalry supported by mobile infantry conveyed by motor transport, preceded by motor scouts, and by artillery conveyed by motors. There being no use for horsemen on the western front, huge masses of cavalry were available, when the opportunity *which the Germans were able to make* offered a chance for success. Great movements such as this often depend on numerous factors wholly beyond the control of the commander; one of these is the weather and we may be sure that the German staff studied the meteorological reports with intense care, and watched the barometer with an anxious eye. In fact, we have long been of the opinion that staff officers should make a methodical study of the weather and how it is influenced by meteorological conditions. At the Staff College, a certain amount of study was devoted to this branch of applied science, but how many officers keep up this study?

Aerial reconnaissance combined with wireless telegraphy has done more towards dispersing the "fog of war" in the immediate front of contending forces than any other modern invention, although atmospheric fog, darkness, and boisterous winds impose severe limitations.

[Scientific and Engineering Aspects of the War. By J. B. C. Kershaw. *Fortnightly Review*. Oct., '15. 6000 words.]

This is the first war in which the striking advances in scientific knowledge made in the latter years of the nineteenth century have had full play. This great struggle has drawn upon the full resources of the scientist and engineer. The dynamo and the petrol motor, smokeless powder and high explosives, inflammable liquids and asphyxiating gases, may be said to be the developments of twentieth century science. Great changes in strategy and tactics have resulted from these and other inventions.

I. *The Petrol Motor.* The development of the petrol motor has made possible the automobile and the aeroplane. The automobile in its various forms has made possible the maintenance of much larger armies in the field. All the multitudinous supplies required by an army are not now tied to the railway lines, but may be transported over the network of roads by means of motor vehicles of various forms. All the armies are now chiefly supplied in this manner, and they are much better supplied than formerly. Fresh bread, fresh meat, and fresh vegetables can now be and are supplied to the troops at the front.

The petrol motor has also made possible the transportation in the field of huge guns and the supply of ammunition to them. This change has rendered obsolete the fortified city and town. The decisive battles will be fought in the open country.

Motor cycles have replaced the dispatch bearer, with great gain in speed and efficiency. The petrol motor also finds application in armored motor cars and motor ambulances.

Another great development due to the petrol motor is the aeroplane. Rapid strides are here being made. From the 50 h.p. motor of five years ago, the power has increased to 200 to 250 h.p. for a single engine. The aeroplane by its reconnaissance discovers the presence and position of troops and batteries, thus rendering surprise much more difficult than formerly, but its greatest success is in directing and controlling artillery fire. The aeroplane has proved more effective than the Zeppelin, even in raids.

II. *Smokeless Powder and High Explosive.* Smokeless powder dates from 1884. Its advantages are that it is smokeless, has greater explosive force, and does not foul the gun. With smokeless powder, riflemen and guns may fire in daylight without betraying their position, provided they be screened from aeroplane observation. "Sniping" has become

a more deadly art, as the accurate range of all weapons is much greater with smokeless powder

High explosives have had a parallel development. The picric acid compounds are derived from carbolic acid. Melinite and lyddite are well known representatives of this class. The latest forms of high explosives are obtained from *toluol,* a derivative of benzol. These "T. N. T." (tri-nitro-toluol) explosives are now recognized as the best for shell fillers, as they are stable and do not act on the metal of the cases.

Fortifications have become obsolete through three causes, the large caliber gun, the long range due to smokeless powder, and the high explosive shell.

III. *Inflammable liquids and asphyxiating gases.* The use of these really dates back to ancient times, and they have simply been made more effective by modern science. The asphyxiating gases vary in composition, but the earlier ones used were sulphurous acid and chlorine. The first results from burning sulphur, the second is carried as a liquid in cylinders and gasifies on liberation. Asphyxiating gas shells and hand grenades have also been used. For defense against asphyxiating gases, respirators charged with absorbing chemicals have been most successful.

Few details of the use of inflammable liquids are known. Compressed air is used as the propelling force, and the liquid is petrol, paraffine and tar, or a mixture of these. These liquids are said to be propelled a distance of 150 feet. Flaming liquids are thrown from a small metal box carried on the back like a haversack, or from larger stationary apparatus in the trenches. They will also doubtless be used in bombs, shells, and hand grenades. When flaming liquids are used, either the spraying machine must be knocked out or the trench must be vacated till the liquid has been consumed. The gases rise and give no special difficulty. Water is useless in putting out the fire, and sand or earth must be used to extinguish it. The bottoms of dugouts should be above the bottom of the trench so that the burning liquids will not enter, and the respirator should be worn.

IV. *Legal and moral aspects.* It may be true that it is no more painful to be killed by asphyxiating gases than by shrapnel or shell, but the fact remains that the use of poisonous and asphyxiating gases is in contravention of Article 23 of the Hague Declaration of 1899.

A later article will deal with those aspects of war in which conditions have been ameliorated by sciences.

—Chronological History of, By Theaters

[The following summary of operations is digested largely from the excellent notes on "Progress of the War in Europe" in the *Amy & Navy Jour.,* and from miscellaneous sources.]

GENERAL *May*

"In the battle record of May," writes F. H. Simonds in the *Review of Reviews* for June, "there was still to be found a cause for German rejoicing, for new confidence that the proud boast of German military writers that German defense could not be broken was altogether sound. Once more Germany had confuted her critics. Once more she had silenced the British and French commentators who insisted that her last reserves were in the field, her maximum striking power reached, if not passed. To the suggestiòn that German collapse was in sight the Galician victories made prompt and crushing answer, while the onrush of German masses in Flanders demonstrated that Germany was not yet ready to accept permanently the defensive rôle on any front."

"The present strategic situation," comments the *Army and Navy Journal,* "indicates more plainly than would any figures obtainable by statistical research and calculation which side in this war has at present the larger number of men available for active operation. The preponderance of population remains of course on the side of the Allies. But it is now at least doubtful whether the Allies will ever be able to make that preponderance tell on the strategic chessboard. Recent utterances in Parliament by Lord Kitchener and Mr. Asquith indicate that Great Britain has no intention of resorting to conscription, which means that she has all the army now that she is going to have; and not until she can withdraw troops from Turkey. if then, will she be able to do any better by France than to hold about one-tenth of the joint battle front, as she is doing or trying to do now. As for Russia, it is evident that her population is no index to her resources in troops. She is deficient in the sinews of war, as a consequence of the blockade to which Germany and Turkey are subjecting her.

"The activity of German submarines has absorbed the attention of the world and threatened to involve Germany in fresh difficulties of great magnitude. Aside from the sinking of the Lusitania, German submarines have displayed increasing activity, and appear to have been entirely undisturbed by the naval forces of Great Britain.

"After a delay of many months Italy is actively entering the conflict. With the declaration of war several puzzling features of the campaigns are explained by statements from official sources. Notably is this the case in connection with the long suspension of hostilities in Servia. It appears that Italy months ago imposed upon Austria the condition that the attack upon Servia must be stopped as a preliminary to the negotiations which sought to keep Italy out of the war. It is apparent that Italian demands covered a wider territory than the immediate neighborhood of the Adriatic. Another matter of international interest is the declaration that Italy enters into a full partnership with the Allies and becomes a party to the agreement that no separate peace may be made by any one of the Allies."

"Lord Kitchener appeals for 3,000,000 troops, and in view of the enormous casuality lists appearing the number is none too great. The men undoubtedly will be found, but the need for officers must present a difficult problem. The War Office announces a modification of requirements. Recruits are to be accepted up

EUROPEAN WAR—Continued

to forty years of age and the minimum standard of height is reduced to five feet two inches."

June

After eleven months of a world-war in which eleven nations are engaged, eight pitted against three, the honors are with the three—German, Austrian, and Turk. Interest has centered throughout this last month in Galicia, where both Przemsyl and Lemberg have opened their gates before von Mackensen's resistless advance. But the Russian army is still uncrushed; no considerable part of it has allowed itself to be shut up in a beleaguered fort; and Duke Nicholas' strategy may yet prove to be comparable to that of Joffre last August.

On the Western front the French have maintained a persistent offensive. "This valiant wing," says the *Army and Navy Journal*, "which has held ninety per cent of the battle line on the west since the war began, is fighting with increasing vigor and determination. Along the 150 miles of winding lines from Lens to Berry-au-Bac these soldiers of France have put the German on the defensive, and in almost every one of the bitterly contested positions they have succeeded in completely dislodging the stubborn foe. In some of the fortified villages desperate struggles have raged for weeks and single buildings or small groups of houses have been taken and retaken; but in the end the Frenchman has held his footing at practically every one of these places. While the attacks have by no means covered this entire front, they have been so distributed that the German commander has required powerful reserves constantly in hand to be despatched to widely separated points where the versatile as well as brave opponent might be expected to develop fresh attacks at any moment. A remarkable feature is the lack of *feints*. There seems no such thing as a pretended attack here to mask the real effort there. It appears as though once engaged the troops refuse to stop until the trench or the building or the fortification has been taken. They are fighting like men willing to die, but determined to drive the invader out of their country at any cost."

England is devoting tremendous energy to the task of equipping her armies with an adequate supply of armament and munitions, for which purpose Lloyd George has organized an army of workmen.

"Recalling the recent criticisms of Lord Kitchener for having sent ordinary shrapnel to Flanders instead of explosive shells, it is interesting to note a late French comment upon the great destructiveness of their *rideau de fer*, or iron curtain, composed almost entirely of explosive shells, as compared with the English shrapnel, which makes little impression upon earthworks. In the sector north of Arras the French are said to have fired nearly a quarter of a million shells in a single day. These expenditures led to brilliant but only local victories in intrenched positions. It will be interesting to learn what quantities will be required to reduce important positions powerfully defended."

Italy has made substantial progress in her preliminary campaign along the Isonzo, but the Austrian defense is stiffening. That the Italian government does not expect an easy victory is evidenced by the announcement that she is ready for a three years' war.

The Russian reverses along the Roumanian frontier, and in her own province of Bessarabia, are likely to have a strong political effect upon that wavering nation, whose 700,000 men are not yet in the field because of failure to agree upon terms with the Allies.

The long expected Zeppelin raids upon London have occurred, and while the British censor refuses details we learn that bombs have been thrown upon parts of London with casualties of six killed and seventy hurt. Numerous fires resulted from the incendiary bombs. On the other hand, twenty-three French aeroplanes attacked the German city of Karlsruhe, capital of Baden and seventy-five miles from the French frontier. Nineteen persons were killed and several dozen injured, while very extensive damage was inflicted upon the city.

British shipping continues to suffer at the hands of the submarines, and in addition to many trawlers the recent losses have included a number of large freight steamers.

Germany is said to be planning to place 18 new corps in the field at the end of July, to replace the losses due to the Galician campaign.

July

July, which rounds out an even year of the great war, has unquestionably been Germany's month. Nowhere have the Teutonic hosts suffered a serious reverse. While they have been holding, and more than holding, their own on the western battle front, at the same time they have been driving before them relentlessly the defeated and ammunition-spent Russians, and seem on the point of crowning their achievements in the east by the capture of the Polish capital. The results of such an outcome would be of more than local importance. "Whenever the day arrives for military prudence to call a halt for the incursions into Russia," says the *Army and Navy Journal*, "there will doubtless be a very large reinforcement of veteran troops available for transfer to the western theater, where meanwhile the German line is holding firmly against the strong attacks of the French and such efforts as have been possible for the British and Belgians. It seems extremely improbable that German ambition should dictate any further attempts against Russia's vast territory than the establishment of a line from Riga through Warsaw to the northern borders of Galicia." Thus the greatest significance of the result in the east attaches to its effect upon the western campaign, for upon the advantages gained here, between the two strongest opponents, Germany and France, hinges mainly the outcome of the struggle.

"There has been no development of concentrated power on the western battle front that has compelled Germany to withdraw any of her forces from the pursuit of their tri-

umphant campaigns in Galicia, Poland and Courland. Certainly Russia has been in grave need of such a diversion, and the failure of the Allies to provide it must be credited to unreadiness, for lack of any more acceptable phrase.

In France there has been an increasing expression of disappointment that Sir John French's army could not have driven a powerful attack against the foe in May and June while the French troops were fighting day and night to find a vulnerable spot in the German lines. English publicists have attributed the unsatisfactory developments on the British front to departmental failures in London. At the conference in Calais, between the civil and military heads of the Allies, it may well be supposed that explanations were made as to the mysterious delay in the long expected offensive campaign on the British front, where the concentration of nearly half a million British troops on a line not much more than thirty miles long had led to great expectations. The 23 divisions on this front would provide between seven and eight men to the yard.

"England has increased the naval personnel for this year to 300,000 officers and men, and recruiting for the army has supplied far more soldiers than can be equipped. Field batteries and infantry are short of supplies, in addition to the well understood lack of shells for the heavier ordnance.

"London advices claim that the training of Kitchener's army has been so far completed that by the end of July the forces in France will be reinforced by an added 750,000 men. It seems probable that their successors in the training camps at Aldershot, Salisbury, etc., will be men raised by some form of compulsory enlistment.

"Canada is raising a large force for service in France, where Canadian casualties have been severe."

"In the matter of the war loan, all England has rallied to the support of the government, and it is thought that the total of new money subscribed will reach $3,000,000,000, which, added to the conversion of old loans into the new issue, will bring the aggregate amount to over $4,500,000,000."

"British government control is to be extended beyond the lines of the laborers and will include restrictive measures in the sale of intoxicants in districts where munitions of war are being manufactured."

"France is beginning to prepare for another winter campaign, and there is no diminution of public courage even in the face of such prospects. There has been an instant response to the government's appeal to the people to exchange hoarded gold for notes at the Bank of France."

"The negotiations to induce Roumania, Bulgaria and Greece to enter the war appear not to progress. The withdrawal of Turkish troops from Adrianople seems to indicate confidence that Bulgaria does not intend to attack the Turks. Even Greek enthusiasm seems to pale in the face of Gallipoli Peninsula."

"The efficiency of the English censor has prevented the publication of further news of the Zeppelin raids on the east coast, but it seems certain that among the places bombarded the shipbuilding center at Hull suffered considerably."

German submarines have sunk a number of large cargo steamships in British waters; several ships on their way to Archangel with supplies have been mined.

Of economic interest is the addition of the vast territory of German South Africa to England's possessions. The diamond and copper yield from this colony is very large, as are its quantities of iron and coal.

"A report to the House of Commons from the British army in France is remarkable evidence of the efficacy of inoculation against typhoid."

"An interesting review of the experiences of the war by a great French writer enunciates the belief that in war nowadays the factor war material and the factor men are more important than the factor genius. Certainly strategy is finding scant expression on battle lines too closely locked to permit any wide turning movements such as have interested students in the campaigns planned in the tents of the great old commanders. The physical courage displayed on all the lines stamps the soldier of to-day as a fighting man quite as ready to face death and hardship as have been the troops of any land or time."

Aug.

With intensified interest the world now awaits the action of the Balkan states in regard to the Great War. For outside of renewed hopes of support from these countries, the Allies can find little encouragement in the last month's record of the war. France still bears the brunt of the grapple on the western part. England is wrestling with her munition problems, and seems as far as ever from the gates of Constantinople. Italy appears almost to mark time in her difficult task of crossing the Alps. Russia, hotly pursued by a relentless enemy, looks in vain west and south for the diversion which might call off her foe. This is Germany's second great offensive of the war; if there is to be another Battle of the Marne at the end of it, there are no signs of it as yet. Stronghold after stronghold has fallen before the Teutonic armies with bewildering rapidity. Many men and quantities of guns have been captured. The main army of the Russians, however, has remained intact. That the Germans have thus fallen short of complete success is due not to any fault of theirs, but rather to Russian skill in retreat. Undoubtedly this policy on the part of the Russian commander-in-chief is prompted by a keen appreciation of Russia's source of strength. To invade Russia is like poking a huge jelly-fish, as far as the chance of making any permanent impression goes. And so the Russians made but feeble resistance at their second line of defense, but continued the retreat to the east, abandoning their great pivotal fortress of Brest-Litovsk after a very brief resistance. Yet these losses

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of the Russians, of cities, of men, of material—though not fatal, are certainly serious ones to them. To lose more of the munitions in which she is already so poor, to be drained of her trained officers and men, to see her enemy in possession of the grain and other resources of some of her richest provinces—these are factors which may spell a long-continued impotence on the part of the Russian arms. What the next German move will be—an attempt to separate the Russian wings, a drive toward Petrograd, a holding action on the east and an offensive in the west—these are matters of conjecture. The German naval reverse in the Gulf of Riga was hailed by Russia as in some degree a compensation for her losses on land.

Italy's declaration of war on Turkey came coincidently with increased activity in the prosecution by England of the Dardanelles campaign. It is thought that the 200,000 Italian troops which have sailed under sealed orders will participate in this expedition. This, together with the possibility of assistance from the Balkan states, which have been seething with political activity, makes Allied hopes brighter with respect to Constantinople.

In England, a notable event has been the adoption of national registration. Every person between fifteen and sixty-five years of age has been called upon for certain information which will undoubtedly be used for purposes of enforced military service and for the better organization of laborers required for public service. The first British colony to adopt compulsory military service is the Straits Settlement, where all men between eighteen and fifty-five have been ordered for training.

An unexpected factor has appeared in the north of Europe, where there has been developed the possibility of an active alliance of Sweden with Germany against Russia. There is small doubt that the great increase in importations in Sweden in the past year has been in the nature of an open door of foreign supplies for Germany.

German submarines have been very active in British waters. But a greater loss, especially in its moral effect, was the sinking by a German submarine of a British troopship en route to the Dardanelles, with a thousand men on board. This marks the first failure of the British Navy to safeguard its transports. Forty-six vessels were lost in July.

Zeppelin raids over the east coast and the suburbs of London in the past fortnight have caused considerable property damage; thirty persons were killed and seventy-three injured.

The British government has now taken over a total of 535 manufacturing plants for the production of war munitions.

Sept.

The close of September marks a transitional period in the Great War. It sees the campaign in the east, the most stupendous offensive of military history, nearing the decision which cannot be much longer postponed; while on the western front the long-expected Allied offensive has been fairly launched.

Moreover, it is a critical time in the Balkans. At such a moment, the entrance of these states into the world-conflict may have a decisive effect, and the decision of Bulgaria, and the answer of Greece and Roumania, are being awaited with ever-increasing interest.

Interest during the month has continued to center in the eastern campaign. The question as to whether Germany could complete her triumph by crushing the Russian army seems to have been answered in the negative; how far she can and will push her advantage, and what will prove to be the fruits of her great advance, remain to be determined. The Grand Duke Nicholas, though deprived of his supreme command, has suffered no loss of military reputation; full credit is awarded him for a skillfully conducted retreat. German pursuit has slowed up all along the line, and although Vilna in the north is an important gain for the Teutons, at the southern end of the line the recapture by the Russians of Lutzk is one of the fruits of a stand in which the Slavs have more than held their own.

Elsewhere,—in France, on the Italian frontier, at the Dardanelles—there has been little change, though portents of happenings to come.

The financing of the war is becoming increasingly difficult, with daily costs increasing, and budgets of unprecedented size. The value of the pound sterling in New York decreased to a minimum of $4.50.

England's enlistments in army and navy now total 3,000,000. She is divided over the question of compulsory service, but optimistic of ultimate victory in the faith that it is a "war of mechanism, organization, endurance—victory will incline to the side that can arm itself best and stay longest."

Russia, whose spirit appears to be far from being crushed by her reverses, has set herself to the organization of another 2,000,000 men, who may be ready to face the Germans in the spring on some new interior line.

Oct.

Last winter, it was freely prophesied that the fall of 1915 would mark the end of the World War. Today, at the close of October, with another nation just added to the combatants, still other countries perhaps about to join, with mighty offensives freshly launched in the Western and Balkan theatres, only a rash prophet would venture to name a date for the war's termination. There have been occasional rumors of peace overtures, it is true, as at the time of Cardinal Gibbons' visit to President Wilson, but a consideration of the terms sketched as those acceptable to Germany—with talk of indemnities, a Polish protectorate, and Austrian hegemony in the Balkans—discloses how futile would be any present attempt to mediate between the belligerents. For any terms based upon the results to date must yield to the Teutonic allies undisputed supremacy on the continent and the domination of the eastern Mediterranean. A year from now, the Allies believe, it will be a different story. When Kitchener told the English

Parliament that Germany "had about shot her bolt," he must have had in mind the policy of attrition, the strategy that ultimately triumphed over the Confederacy, not primarily by winning victories in the field, but by systematic killing until numbers failed the numerically weaker side. The grounds for this belief are found in a consideration of the statistics of numbers involved. Frank Simonds, in the October *"Review of Reviews,"* estimates that the present strength of the Allied armies is about 4,500,000; that of their opponents 5,250,000. Reviewing the losses to date, and the populations of the nations engaged, he concludes that by Aug. 1, 1916, the Teutonic numbers will have fallen to about 3,200,000, while the Allies, with Russia's limitless capacity as their main asset, will have increased, perhaps to 7,000,000.

Such "statistics," however, give but scant basis for prophecy, and fail to take into account such factors as Bulgaria's entrance into the war. This material gain for the Germans, unbalanced as yet by any similar Allied accession, has been the dramatic event of the month. German diplomacy seems to have scored a marked success, and the movement of the Bulgarian armies into Serbia, in conjunction with the audacious Austro-German invasion from the north, has created a critical situation in the Balkans for which the Allies appear to be very ill prepared. The Saloniki-Nish railroad is a slender highway at best, by which to send much needed help to Serbia, and this is already cut by Bulgarian forces. Rumania is naturally loath to grant Russia the desired privilege of crossing her neutral territory. Italy still stands aloof from participation in this theater, while Greece, treaty obligations notwithstanding, announces her neutrality. Even England's reported offer of the Island of Cyprus has thus far failed to secure her allegiance. The question of inviting Japan to send an army to Europe is being heavily debated in London, Paris, and Tokio.

Such are some of the factors, military and political, which complicate the present situation. Altogether, it has been a very disappointing month for the Allies. Their tremendous drives in Artois and Champagne achieved, it is true, much of value, both in prisoners captured and in the very considerable advance of the French and English lines. But Lens is still untaken, the Challerange-Bazancourt railroad remains under German control, and the mighty "general offensive" has halted all along the line, and has barely held its own against German counter-offensive. When Bulgaria's decision was announced, public disappointment in France and England became marked. M. Delcassé, the French Foreign Minister, resigned, while the English cabinet lost its Attorney General, Sir Edward Carson, through a similar reason. General Hamilton, commanding the Anglo-French Dardanelles army, was recalled to England, and the question of entirely abandoning the Gallipoli campaign was warmly debated.

Only from Russia, recently so hard-pressed by her invaders, now came encouraging news. The Austro-German forces no longer made headway; Dvinsk held out successfully, and Riga, though hard-pressed, seemed holding its own; in the southern part of this theater the lines swayed backward and forward, with the advantage rather on the side of the rallying Russians.

During the entire war, there has scarcely been a more complicated, unsettled, and more interesting situation.

Nov.

During November, all eyes have been turned toward the Balkans. It has almost seemed as if the combatants elsewhere had paused in their exhausting struggle to watch little Serbia, fighting gallantly against her enemies on front and flank, and hoping daily for the aid that has been so slow in materializing. Either of her foes alone, Serbia might have met successfully; together, they have swept over the little Balkan state in a resistless advancing tide. As the month closes, Prisrend on the western frontier, and Monastir in the extreme south, the last important towns left to the Serbians, are reported as also captured. All their railroads are lost except the line from Saloniki along which the French advanced nearly to Veles. These railroads have been the controlling strategic factors in the campaign. By controlling the Belgrade-Nish line, the Teutonic-Bulgarian forces are about to open the way for Turkey to receive her much-needed munitions by rail. By seizing the railroad south of Nish, the Bulgarians early shut off the northern Serbian armies from their main source of supplies. By capturing the important junction of Uskub, the invaders made a union of northern and southern Serbian armies well-nigh impossible.

Throughout the month, the military situation has been much complicated by political considerations. The unwillingness of Greece to make up her mind to jump either way has created a situation unprecedented in the history of international law. Having permitted an Anglo-French force to land, and march through her neutral territory into Serbia, Greece now confronts the not-improbable contingency of having these troops thrust back into her borders by a united Teutonic and Bulgarian host. If she disarms them, she will incur the hostility of the maritime powers whose commercial and political friendship are such a potent factor in her life. If she accepts the other alternative and does not molest them, she is likely to find her own territory invaded by the pursuing forces, and herself involved in a war with her much-feared neighbors on the north. The maintenance of neutrality by Greece is difficult, swayed as she is, on the one hand by the King and his advisers, and on the other by her greatest popular leader, Venizelos.

Rumania furnishes another uncertain element in the Balkan situation. With her army of some half million men, her entrance into the conflict would have a most decisive influence. So far she has adhered scrupulously to the rôle of neutral; there is no evidence that Russia's promised army of 350,000 men will invade Bulgaria via Rumanian territory.

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The part that little Montenegro is playing in the Balkan campaign is not important, except that her pluckiness challenges admiration, and her territory affords a refuge for remnants of the retreating Serbian army. Other Serbian forces have been driven across the border further south into the less friendly country of Albania. This region has an additional interest as the possible landing place of an Italian supporting force, oft reported to be about to disembark at Avlona or Durazzo.

The Balkan invasion was no easy task for Germany. This is evidenced by the marked thinning of the German lines in Russia, whence came the forces that comprised the army under von Mackensen. Whether or not the Teutons expected to make much further progress on the eastern front is an open question; certain it is that their attacks against Riga and Dvinsk, which have not lacked severity and persistence, have been frustrated by the Russians. The latter now appear to be plentifully munitioned, and have slightly more than held their own against the invaders. From the Pripet marshes south to Galicia, especially, the Russian counter-offensive has gained considerable ground against the Teutonic allies; this success was somewhat offset by Russian reverses on the Styr toward the close of the month.

There has been no bloodier field of battle during the month than the Isonzo sector on the Austro-Italian frontier. Particularly has the battle raged around Gorizia, which the Italians have attacked with a stubbornness and tenacity matched only by that of the defenders. The capture of this city, which appears imminent, may mark the first important advance of the Italians in six months of fighting.

In Belgium and France, practically no further progress has been made by the Allies, who have had to fight hard at certain places in Artois and Champagne to hold the most vital parts of the advance of a month ago. The constant German attacks, although not made in great force, show nevertheless that their whole line continues to be strongly held on this front and to possess considerable bodies of reserves.

Considerable activity is reported in the British Mesopotamian campaign near Bagdad. From the conflicting reports it is at least clear that the British have met substantial opposition, and may have had to retire down the Tigris.

Most military critics affirm that the Gallipoli campaign has been a complete failure. Kitchener's visit to the East, however, on a mission which has remained somewhat of a mystery, has not resulted in its abandonment, but rather in an increased activity, with some advances of the Allied lines.

The formation of a central War Board to control all of the operations of the Allied armies will be a step of great interest when effected. Although the plan appears to have won general approval, no details as to personnel or methods are yet available.

No fewer than twenty German merchant ships were sunk in the Baltic by British submarines between Oct. 11 and 23, but all the crews were allowed proper time to save themselves.

The activity of British submarines in the Baltic Sea against German ships is further emphasized by the sinking of the fine armored cruiser *Prinz Adalbert* on Oct. 23, with the loss of most of her complement of 557 men.

The greatest loss by submarine attack during the month was that of the Italian Line steamer *Ancona*, carrying nearly 500 passengers and crew, sunk in the Mediterranean on Nov. 9 by a submarine flying the Austrian colors, with the loss of some 150 lives. Some American passengers were on board the *Ancona.*

THE WESTERN THEATER

May

In the successful German attack on the English position on the Yser Canal on April 22, it "appears that the Germans carried their line south about a mile and a half on a front of about four miles, making a gain in territory of some seven square miles, or about three times as much as the British made at Neuve Chapelle." Moreover, "it should be considered that, mile for mile, this gain of the Germans north of Ypres is more important that that of the British at Neuve Chapelle. The German advance is in Belgium; that of the British was in France. While the Allies want to get the Germans out of France, they are not committed to that purpose as they are to the restoration of Belgium to the Belgians. It is a discouraging preparation for a campaign for the invasion and conquest of Belgium to be driven further into the little corner of that country which is still held by the Allies."

An additional two and a half to three square miles of territory was gained by the Germans the following week, as the result of another drive against the British lines about Ypres; this included most of the British position at Hill 60.

"Dunkirk, in France, was bombarded from the vicinity of Dixmude, in Belgium, the range being about twenty miles. Twenty-eight shells fell into the place. According to German report they were aimed at the defenses. What effect they had upon them is not known. The casualties are reported by the French as twenty persons killed and forty-six wounded." Bergues, another supply depot 5 miles southeast of Dunkirk, was also subjected to a long range bombardment.

Indecisive fighting was reportetd in Argonne. The first week in May, the French repelled attacks near La Bassée, and at Beauséjour in Champagne, the Germans checked two French assaults near St. Mihiel.

"Five hundred shells, most of them incendiary, were fired into Rheims in retaliation for fire directed from that place upon places in rear of the German line, presumably undefended."

During the second week in May, the British line near Ypres again yielded ground, Hill 60 continuing to be a local storm center, on which trenches were alternately won and lost. Between Ypres and Zonnebeke attack and counter-attack succeeded one an-

other for several days, with heavy losses on both sides.

In the meantime a French-British offensive of great importance was developing "north of Arras, where the Allies brought four new army corps into the fight, in addition to the forces already employed there. This action opened between Carency and Neuville, where the French captured several lines of trenches, which they are holding firmly. These successes were extended to Souchez, Loos and Vermelles, just west of the line Arras-La Bassée. A German counter-attack from Ablain St. Nazaire was repulsed, and reinforcements hurried from Lens and Douai were insufficient to turn the tide."

"These battles covered a front of about twenty-five miles and extended on the north to within less than thirty miles of Ypres. The appearance of 160,000 fresh troops in this region makes it evident that the Germans will require enormous numbers for the renewal of their effort to push through toward the coast."

German attacks at Berry-au-Bac and in the Forest of Le Prêtre were repulsed; French infantry attacks farther to the east and near Flirey also failed. The Germans retained possession of the much-disputed Hartmansweiler Kopf near the Alsatian frontier.

The Allies' offensive north of Arras was continued the following week. On a two-mile line just north of the La Bassée-Béthune line, "the British after several failures succeeded in driving the Germans back for a considerable distance and captured several hundred prisoners. These offensive efforts against entrenched positions have demanded very great expenditures of ammunition, including that of the highest explosive type, which England is now said to be producing in satisfactory quality and quantity."

"The French, after a thorough preparation by artillery fire, successfully attacked the German positions on the west bank of the Yser Canal at Steenstraate and Het Sast. The loss of these positions greatly relieved the position at Ypres, which was in danger of an enveloping attack to the rear. Nevertheless Ypres continued to be closely invested from the north, east and southeast, where the Germans still hold the ground won in their recent great effort. The latter also had a local but brilliant success to the northwest of Ville-sur-Tourbe, in Champagne, where, following the explosion of a mine, the German infantry gained a foothold in a salient of the French position. Several counter-attacks with the bayonet and hand grenades resulted in the recapture of the lost ground, with some prisoners."

Late in the month the English lost part of their lines east of Ypres in an attack in which the Germans used poisonous gas more extensively than on any previous occasion. Field Marshal Sir John French says: "The gas was used on a front of five miles, where it was emitted from cylinders throughout a period of four and a half hours, and at the same time the line was bombarded with asphyxiating shells. The gas cloud rose in places forty feet from the ground." The Field Marshal expresses the conviction that with due precautions this form of attack can be met and defeated. In this battle the Germans captured two fortified farms and approached Hooge, which is on the Ypres-Menin road, two miles east of Ypres. The gains were accomplished at great cost. Near Langemarck after a violent bombardment a German column tried to gain a footing on the highway toward Ypres, but the effort failed. In a wood to the north of Ypres German trenches were twice stormed unsuccessfully by British Guards. Later two battalions of Canadian Highlanders, the 16th and 13th, won the position at a cost of 2000 casualties.

French troops persisted successfully in their attack north of Arras, which has progressed steadily, although with small gains from day to day. The almost continuous fighting in the neighborhood of Souchez-Ablain St. Nazaire did not result in any notable advance, although the steady small gains required great efforts on the part of the French troops employed in this close fighting. The British offensive west of La Bassée has made progress during the month on a line three miles long. Both French and British admit heavy losses in the fighting north of Arras, but claim to have inflicted proportionate losses upon the Germans.

"Near Cernay towards the close of the month, the French artillery destroyed a bridge across the river Thur, in Alsace. Cernay, the supply base of Hartmansweilerkopf, is threatened, and the roads about the town seem to be commanded by the French batteries. The infantry, however, appear to have for the present abandoned to the Germans this important height, which guards the valley of St. Amarin, on the frontier."

"In the forest of Argonne the Germans exploded several mines, but the infantry which attempted to advance was repulsed with severe loss inflicted by the French artillery and a large number of hand grenades used by the French infantry."

"A fleet of nineteen French aeroplanes raided the Rhine valley, carrying the attack more than 100 miles beyond the frontier. The French War Office states that the fleet remained aloft for six hours and succeeded in destroying the famous Badische Aniline Chemical Works at Ludwigshafen, opposite Mannheim. This news is of much interest because these works undoubtedly produced the poison gases which have been employed by the German armies in Flanders. Here for many years chlorine has been manufactured in very large quantities for commercial uses. French aeroplanes are said to be using bombs of greatly increased power."

"There has been no attack during May from the channel upon the extreme German right, which continues to rest undisturbed near Nieuport and for a distance of nearly twenty miles south." "A very strongly fortified second line is said to be in course of preparation should the Germans find it necessary to fall back from the present positions, which have recently wavered under the powerful thrusts of the new allied armies. This line would be

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found approximately to run from the coast west of Bruges and Ghent to Courtrai-Tournai-Antong, with Lille as the apex. Lille seems the strategic point upon which German defensive or offensive movements in this region are likely to revolve."

June

"The western theatre," says the *Army & Navy Jour,* "continues to present an unsolved problem. Here over hundreds of miles vast armies face each other on almost exactly the same lines which they occupied six months ago. Very heavy battles have been fought, especially in the past six weeks; and yet a line traced on the map showing the position on June 15 would so nearly match the line of Dec 15 that only a very close study of details would disclose the slight variations. And even more significant is the fact that the slight gains made at the cost of many thousands of lives have nowhere improved the strategic situation considered as a whole. The only benefit secured at such heavy cost has been the moral effect upon troops, who have been taught that they can take the enemy's outlying trenches whenever they are willing to make the sacrifices required.

With no apparent possibility of turning either flank, this whole campaign promises to degenerate into a wearisome waiting for the gradual exhaustion of the enemy's men and munitions.

During the first week in June the persistent French offensive in the vicinity of Lens was continued, and yielded small, steady gains. An elaborately intrenched German position southeast of Neuville and due north of Arras was the center of hot fighting. Here in this "labyrinth," which marked the farthest point reached in the French drive, scarce a mile from the Arras-Lens highway, the French took 450 prisoners. Ablain St. Nagaire was finally occupied by the French, after a three weeks' street-to-street contest.

The severe fighting of the following week in this same sector resulted in the consolidation of positions won rather than in further advances. The sugar refinery at Souchez remained in possession of the French after changing hands several times. In the "labyrinth" the French continued to make progress.

"In this important field work melinite has been used in great quantities to blast the defenders out of one line of trenches after another, and the French infantry in converging attacks splendidly sustained have penetrated to the heart of the position. The front along which this attack on Lens has progressed for the past month is about five miles long and approaches the objective from the southwest, where between Notre Dame de Lorette and the "labyrinth" the Germans have been driven from an irregular area less than two miles wide at the point of greatest loss."

Thirteen miles southwest of Arras the French opened a new attack at the town of Hebuterne, which marks the most westerly extension of the German line. Two lines of trenches were successfully stormed on a front of 1,200 yards, and with the capture of 400 prisoners. North of the Aisne after a violent bombardment French infantry took in one dash two successive lines of trenches with 200 prisoners and three 77 millimeter guns. Three counter-attacks were repulsed. The scene of this battle is midway between Tracy-le-Mont and Moulin sous Jouvent, about nine miles southeast of Noyon. At Ville-au-Bois, thirty-seven miles farther to the east, the French lost heavily in an effort to recapture a position lost in May. Throughout this entire battle front the French offensive rarely fails to make small, steady gains, and their defensive resists successfully all of the German counter-attacks.

Along the rest of the French lines there were few changes. A ridge in the Le Prêtre Forest near St. Mihiel was won in a brilliant bayonet charge by young soldiers of the 1915 class, only to be lost after a violent bombardment.

At Vauquois the French sprayed flaming liquid on the enemy's trenches, but their attack was repulsed with considerable losses inflicted by the German artillery.

Meanwhile to the north there had been comparatively little fighting. Sir John French announced a slight British gain at Festubert, northwest of La Bassée, and the recapture of the Château Hooge, which marked the crest of the German advance toward Ypres; otherwise the English troops enjoyed something of a respite from the almost continuous hammering of the preceding weeks.

The German position in the vicinity of the Channel remained immune until the third week of June, when Belgian aggressiveness forced it back slightly near Westende. During this week, also, Sir John French launched two attacks upon the enemy. North of Hooge, on the east front of Ypres, the English took first line trenches on a front of 1,000 yards. Between Festubert and La Bassée British infantry stormed the German front line trenches, but on the same night were driven out by strong counter-attacks, losing heavily.

Now at length the great French drive toward Lens paused; the few attacks on both sides in this sector failed to accomplish anything decisive. Eight German battalions endeavoring to recapture the lost position near Tracy-le-Mont were severely punished and defeated. The artillery fire has been heavy and well nigh constant, including not only this section, but also at places much further east, as, for instance, at Les Eparges, where there occurred a heavy artillery engagement.

Later in the month came reports of renewed activity by the French in the St. Mihiel district. Trenches won on the heights of the Meuse were partly regained by German counter-attacks, arrested by asphyxiating bombs and—another new departure—flaming liquids. The tale of fresh French advances north of Arras is repeated, and French progress reported in the valley of the Fecht in Alsace.

A French account quoted by the *Army & Navy Journal* gives an illuminating picture of present conditions.

"It describes the capture of a fortified farm (La Quennevières) east of Tracy-le-Mont, on the front nearest Paris. The attacking column of four battalions was composed of zouaves, tirailleurs, Moroccans and Bretons, who without haversacks carried three days' rations, 250 rounds of ammunition, hand grenades and a sack filled with earth to serve as a temporary shelter in the captured trench. At the command the whole line rushed across the intervening 150 to 200 yards. The zouaves charged on past the second line of trenches toward Toutocut Ravine. The whole position was captured and quickly fortified against the counter-attacks and communicating trenches were dug to connect with the main position. The counter-attack followed at once, but was repulsed by the French artillery covering the infantry. French aviators reported fresh German reinforcements coming forward in auto busses, and these fresh troops attacked during the night unsuccessfully. The French counted on the ground where the counter-attacks took place nearly 2000 dead, and they estimate the enemy's total loss in dead to reach 3000, exclusive of wounded. The French loss was 250 killed and 1500 wounded, nearly all from exploding shells. Twenty quick-firers were captured. Remembering that the taking of this farm was perhaps the easiest success won by the French in the fighting of the past month, we have a basis upon which to figure approximately what the losses must have been at the Lorette Hills, Ablain St. Nazaire, Souchez, Neuville and the Labyrinthe, where there was constant heavy fighting for weeks."

July

On the western front the story of the war continues to be one of a swaying deadlock, with but minor changes—here a hard won gain of a few yards, there a costly repulse. The French have continued to bear the brunt of the Allies' efforts, but their splendid offensive movement toward Lens has abated somewhat of its vigor; while the Germans, for their part, have achieved gains in the vicinity of Verdun not without significance.

Along the Belgium and English fronts the month passed in comparative quiet, except for the continuation of artillery fire. The English still felt their inferiority in ammunition supply, and probably suffered more than their opponents. In the second week a small success was credited to them in the capture of 200 yards of German trenches near Pilkem, north of Ypres. This position was captured with the assistance of French field guns, and held against several counter attacks. Later in the month several spirited attacks and counter attacks occurred in this region, as a result of which the English report the capture of additional trenches, but admit the loss of Hill 60, south of Hooge.

In the Arras-Lens sector, Souchez and the Labyrinth continued to be prominent storm centers. The former town, which with the capture of the railway station and the sugar refinery, seemed about to fall before the vigorous French attack, has remained in the hands of the Germans, who strengthened their position and regained some of the ground lost.

"Four miles south the struggle in the eastern edge of the Labyrinth has gone on continuously and the fighting here is hand to hand with bayonet and grenade. The heroic tenacity with which the French have clung to most of the positions which they have gained in this sector is the one great outstanding fact in the reports of the past month. There have been and are still endless counter-attacks by the enemy. The French seem unable to carry forward the attack which was started directly at Lens through Angres, and the Germans seem to have pushed them back somewhat even from the positions won on this road. Arras, firmly held by the French, has been steadily battered by heavy artillery, whose shells have been dropping in this town for more than 250 days. The French and German trenches here are forty yards apart."

The last week of the month saw a period of comparative quiet in this sector.

Southeast and eastward, around the curve of the great battle line, we find little activity except for artillery fire, until we reach the Argonne. Here the Crown Prince's army was heavily engaged, and the fighting has progressed from artillery and fire to close hand to hand fighting with bayonet and grenade. The French trenches between Binarville and La Four de Paris were taken with more than 2,500 prisoners. This advance is from an eighth to a fifth of a mile on a three mile front.

"In the Le Pretre Forest sector a German attack spread as far as Fey-en-Haye, while another effort was directed to the part of the forest west of Croix-des-Carnes. Both attacks were checked by the French artillery and infantry fire, but not until the Germans had won along a front of about two-thirds of a mile a footing in their old lines, which had been held by the French for several months. The successful rush caught the French unawares, and among the thousand unwounded prisoners were all of the officers of a battalion.

"This advance, considered the most important since that at Ypres two months ago, progressed a quarter of a mile before it was stopped and won a strip of ground which is covered by a maze of trenches. A less important success was also due to a surprise attack, and resulted in the capture and destruction of a French blockhouse position near Haut-de-Rieupt, south of Norroy, on the Moselle."

The following week, the Crown Prince continued these successes. Northeast of Vienne-le-Château the Germans stormed the French positions on a width of nearly two miles to a depth of about half a mile and captured the hill La Fille Mortes. Nearly 3000 officers and men were made prisoners. To understand the full significance of these advances it is necessary to consider also the German

EUROPEAN WAR—Continued

activity about St. Mihiel. Southeast of that town, between Ailly and Apremont, the capture of French positions along a line of 1500 yards expanded the head of the German salient by 700 yards, and indicates a fresh German offensive in this region. St. Mihiel is only thirty-five miles from Vienne-le-Château, as the crow flies, and if these entering wedges can be pushed together by the Crown Prince, the communications of Verdun will be severed. At Les Eparges the Germans are only twelve miles from Verdun. The French, however, have not been idle in this sector. The heavy fighting that occurred in the vicinity of Les Eparges was evidently part of a vigorous French effort to reach the highway toward Vigneulles—St. Mihiel. This fighting about Les Eparges was continued through the month, with indecisive results.

The capture of Metzeral, in the Vosges, late in June, appears to have been a very creditable feat, in view of the strength of the German lines. But it has not led to any general advance on Colmar. Here the situation is quiet, though rumors have come of the massing of German forces in Neubreisach and Mülhausen. A brilliant French success at Fontenelle resulted in the recapture of some lost trenches and the taking of 800 prisoners.

Aug.

The reports from the western battle front give no news of great significance. On the eastern front there are sweeping advances, fallen strongholds, fleeing armies. Here in the west one reads of an artillery duel, a mine exploded beneath a trench, an air-raid on the enemy's depot. There are no signs of the great Allied thrust, whereby Russia might hope to obtain a breathing spell.

Little activity was reported in the northern sector, except that of the artillery. The long-range bombardment of Dunkirk and the neighboring towns was continued intermittently. The famous bridgehead at Dixmude once more remained in possession of the Belgians after a particularly desperate German assault. Toward the close of the month, the Belgian ports of Zeebruge and Knoche were bombarded by a British squadron, which came in under cover of the morning mists, presumably to search out the hiding-places of the German submarines. It has been pointed out that this flank might well be the subject of a more serious attack by the British.

Beyond the usual artillery exchanges, almost the only action worthy of mention in the Ypres district is Sir John French's report of the capture of German first-line trenches near Hooge along a front of 1200 yards. As the German position at Hill 60 rendered a part of the lines thus gained untenable, their capture is of doubtful value. This English gain is offset by a German advance on the Menin highway over nearly a 500 yard front, the attack being supported by flame projectors.

Bombs and hand-grenades figure prominently in the reports of the fighting about Arras. No considerable gains, however, are chronicled; the Labyrinth and the adjoining trenches are so well prepared for defense that progress in either direction seems impossible.

In the Argonne, a fresh advance is credited to the Crown Prince's Würtemburgers, which has brought the Germans to the vicinity of Bethincourt-Harcourt, some ten miles northwest of Verdun, where artillery duels continue. Otherwise no progress has been made in the effort to close the circle about Verdun. East of St. Mihiel there has been considerable activity at Flirey and in the forest of Le Prêtre.

The Vosges district continued to be the scene of violent fighting, with scant results. Night attacks seem particularly popular,—in one of these the French are credited with a brilliant victory, in the capture of some works and 800 men at Bande Sapt.

It has been a month of unusual aerial activity, and the aggressiveness of the French aviators seems to be constantly increasing. A French attack on the German city of Saarbrucken was carried out by thirty-two heavy flying machines, which dropped a large quantity of explosives and whose line of retreat was meanwhile safeguarded by a number of very fast battle planes, which engaged the German fighting machines when they attempted to cut off the retreat of the heavier and slower units.

The most extensive air raid of the war so far was carried out on Aug 25, when sixty-two French aviators bombarded the German munition factories at Dillingen, Bavaria, flying a distance of more than 150 miles and return from a French aviation camp in the Vosges region. They dropped 150 bombs, thirty of large caliber, carrying high explosives.

Sept.

In the detailed reports of the first half of the month there seems to be little worthy of special notice here. Continued activity by the artillery of the French, who seem more willing to sacrifice shells than men, bomb and grenade fighting, charges that gain ground by inches, bombardments with German asphyxiating shells that have lost the terror of newness, raids by French aeroplane squadrons upon German munition plants—thus the tale went.

In mid-September, however, came news of the most serious fighting since early summer. On the western front of the Argonne, the Crown Prince once more attempted to cut his way toward St. Menehould, west of Verdun. In the attacks by Wurtemberg and Lorraine regiments, heavily supported by artillery, near Vienne-le-Chateau, a gain of captured trenches and supports was made over a front of a mile and a quarter, and a depth of 350 to 600 yards. The fortified position of Marie Thérèse fell into the hands of the Germans, together with 2000 men and 50 machine guns. French communications with Verdun through St. Menehould are in nowise embarrassed by this German gain, which the latter were unable to follow up.

The next week saw a combined artillery bombardment of the German positions on the Belgian coast, French heavy siege-guns co-

operating effectively with the British fleet. This may presage a determined attack on the German flank, which offers some tempting inducements. The bombardment, however, is merely one manifestation of the general activity all along the line. It would seem that Allied supplies of munitions are now plentiful; that their artillery is seeking to batter the German trenches and search out their weak spots, and that the Allies are bent on a determined offensive, of which the first reports are already received (Sept. 26) and which indicate some considerable initial successes. Certain it is that the front occupied by the English has been extended to cover at least 50 miles, and Kitchener's army now feels prepared to do its part in the coming campaign.

The aerial fleets of the Allies have been more active than ever during the month. Sir John French reports nine air battles in a single day; while the French raids have made themselves felt against hostile hangars, railway stations, passenger and troop trains, factories, etc. Even the palace at Stuttgart, a hundred miles from the frontier, was the target for one daring raid which resulted in considerable damage. German aerial activity, on the other hand, has manifested itself in further attacks against London; two Zeppelin raids have caused appreciable damage and loss of life, chiefly among the civilian population. France lost by a German bullet her air hero, Pégoud, while the latter was maneuvering against one of the powerful new Aviatiks built by the Germans.

Oct.

The last week of September had been marked by a bombardment of the German lines in the west, that proved by its intensity and duration that the Allies no longer felt deficiency of ammunition. When the German trenches had been thoroughly shaken by this tremendous rain of artillery, on Sept. 26 the attack developed on which the English and French based great hopes of decisive victory. In the continuous entrenched line, two spots had been selected for the assaults, and the Allied reserves concentrated at these points. One of these objectives, was the town of Lens, in Artois, an important railway center in the French coal-fields, some 20 miles southwest of Lille. The plan of attack, in brief, was to drive at two points, thus forming a deep salient in the hostile line, then to crush in both sides of the salient. Several preliminary British attacks opened, near Ypres, Armentières, and La Bassée. These secured no important advance, but engaged German troops that were sorely needed further south. The main British attack was directed from Grenay against the north side of the Lens position, toward the town of Loos. So well executed and so promptly supported was this drive that it swept through Loos (two miles north-west of Lens) to Hill 70, two and a half miles in all. This commanding hill is only about a mile from Lens, and seriously threatens the German position. The troops engaged included large numbers of Kitchener's new recruits, whose persistent advance against such fortified positions stamps them as first class fighting men. At the same time the French had advanced from Neuville St. Vaast almost as successfully in the course of three days, and to Hill 140 and the heights of Vimy, some three miles south of Lens. Their total advance averaged over a mile on an eight-mile front, and included the much disputed lines about Souchez. Thus a new salient was formed in the German line, with Angres at its apex, and Lens between the tips of the salient, which were scarcely five miles apart. It was an advance which heartened British and French adherents, and seemed to promise further gains.

Simultaneously with this drive came a French attack in Champagne. Here, between Challerange and Bazancourt, there is a railroad which forms an important link in the line that largely supplies the German front from Rheims to Soissons. At this line of communications the French struck, and struck so successfully that they reported an advance of two and a half miles over a fifteen mile front. The town of Tahure and its nearby commanding hill, were taken later (Oct. 5) and a position secured some two miles from the railroad, from which it was hoped to interfere to some extent with traffic. In one locality the attackers actually crossed the railroad, only to be swept back again. Tahure was a point of support in the German second line of trenches. The total German loss, in both these attacks, was reported to be 120,000.

Since this supreme effort, there have been no important developments in the western theater. Vigorous German counter-offensives, while they have generally failed to dislodge their opponents, have at least prevented further advances, and have given time for the preparation of fresh defensive lines to the rear. The third German line of trenches, indeed, has not been pierced. Allied efforts have been expended in consolidating their positions and holding their own,—with only slight additional gains about Tahure and actual losses of trenches in other localities. Altogether, it has been amply demonstrated and more that a strongly entrenched position of successive lines is well-nigh impregnable against direct assault. Trenches must be literally blasted out by artillery fire, and an entering wedge that pierces the first line merely begins a task which must be pushed home by inches.

Elsewhere in the west there has been little activity. In the Vosges, the Germans made a powerful attack on a front of three miles between Rehfelsen and Sudelkopf. The attack was preceded by a storm of shells of all calibers and of big bombs with projectiles filled with gasoline. They won again the trenches on the summit of Hartmansweilerkopf, besides some small French posts toward the Wuenheim road. Along the Belgian lines there have been bombardments, and some minor indecisive engagements.

German and French air-squadrons have continued to pay visits to their opponents' hangars, railroad stations, etc.: and another Zeppelin raid on London has resulted in the death of several score of inhabitants, but achieved nothing of military importance.

EUROPEAN WAR—Continued

Nov.

If, as some Allied writers claim, inferiority in population has already begun to tell on the field armies of the Central Powers, there are no indications of it on the Western front. German ability to withstand Allied attacks throughout this long line remains a miracle. The French and English have even been forced to yield a little of the ground gained in September. The Germans, though they attempt little beyond regaining the points lost a month ago, have both men and munitions to launch strong local attacks. At the end of the month, came reports of heavy German reinforcements behind the Arras-Armentières line, apparently meant for some strong offensive operation.

The Belgian lines have witnessed little beside bombardments. A variation occurred at the close of the month, in a spirited and successful (though small in numbers) surprise attack by the British near Ypres.

In Artois, fighting has continued on a small scale, with few intermissions. Lens has been heavily bombarded by the French; the Labyrinth has again been the scene of heavy fighting; the Germans report slight gains at Neuville-St. Vaast and elsewhere.

The fighting east of Tahure has been especially stubborn. A powerfully organized group of German trenches on Hill 196, some 1200 by 250 yards in extent, known as "La Courtine," was taken by the French, and held in part against counter-attack. The Germans, for their part, took the Butte de Tahure, with 1400 prisoners.

Mining seems to play an increasingly important part in the trench warfare in this theater. Grenade fighting is also very common. The Germans continue to use jets of liquid fire extensively on the defense.

Aerial activity has continued unabated, five air fights having been reported over the British lines in Flanders in one day. In no other arm are individuals so often commended for gallantry. Thus:

"A brilliant aerial exploit is attributed to Sergeant 'G. G.' (French) who on one trip destroyed an enemy captive balloon and one of its aeroplane sentinels." Similarly,—"the noted German airman, Lieutenant Ingelmann, shot down his sixth enemy aeroplane, an English Bristol biplane carrying three machine guns."

See also
Arras, Battle of
Asphyxiating gases
Belgium—Fortifications
Marne, Battle of the
Mons, battle of
Neuve Chapelle, Battle at

NOTES ON OPERATIONS IN THE WESTERN THEATER

[Miscellaneous. The 1914 Campaign in the Western Theater of Operations. *Mem. de Artill.* (Spain). May, '15. 6000 words.]

(This is a bare résumé of operations which are given in detail elsewhere).

[The War in Europe. Note. *Army & Navy Jour.*, Nov. 6, '15. 100 words.]

The *London Chronicle* severely criticizes the operations in the British offensive of Sept. 25 in Northern France. The Guards, 21st and 24th divisions failed to support the 7th and 15th divisions, resulting in the loss of the ground gained by the latter.

[Review of the Operations of the Belgian Army, 31st July to 31st December, 1914. By Major W. A. J. O'Meara, late R.E. *Royal Engineers' Jour.*, Nov., '15. 13,000 words. 3 maps.]

(This is a review of a report by the General Staff of the Belgian Army, in nine short chapters, entitled "L'Action de l'Armée Belge pour la Défense du Pays et le Respect de sa Neutralité," and published by W. H. & L. Collingridge, City Press, 148 Aldersgate St., E. C., London.)

Preliminary Details. When war broke out, only a commencement had been made on the reorganization of the army, recently authorized to provide for an increase eventually, in 1918, to 350,000 men. War having become imminent, three classes of the militia were recalled to the colors, and on July 31 the mobilization of the forces was ordered.

The peace time headquarters of the army were as follows: 1st Division—Ghent; 2d Div.—Antwerp; 3rd Div.—Liége; 4th Div.—Namur; 5th Div.—Mons; 6th Div. and Cavalry Div.—Brussels. The centers of concentration were so chosen as to enable Belgium to fulfill her treaty obligations as a neutral state, and to resist invasion from any direction. The defense of Antwerp, Liége, and Namur was entrusted to the seven oldest classes of militia.

On Aug. 2 was received the famous German note, demanding an unopposed passage through Belgium for German troops. To this the Belgian Government replied that it would "repel by every means in its power any attempt whatsoever made by Germany on the sovereign rights of Belgium," as well as by any other nation. In consequence of information received the night of Aug 3, the destruction of the bridges on German lines of advance was ordered. At the same time, the 1st Div. was ordered to Tirlemont; the 2nd Div. to Louvain; the 5th Div. to Perwez; the 6th Div. to Wavre. This movement was covered by the Cavalry Division at Waremme and by mixed brigades at Tongres and Huy, and was completed on Aug 5, King Albert taking the supreme command. The total strength of this field army was 117,000 men, to whom were added later 18,500 volunteers.

It was recognized in Belgium that the invasion of the Germans presaged an offensive movement against France in overwhelmingly superior numbers, and it was prescribed that the Belgian forces should not run the risk of severe loss, but act so as to secure their lines of communication and form ultimately a junction with the French and English forces.

The Defense of Liége. On the 4th of August, two divisions of German cavalry crossed

the frontier. Finding the bridge across the Meuse at Visé destroyed, they forded the river farther down. Close behind this cavalry came seven German corps, some 300,000 men, all converging on Liége. After the demand for an unopposed passage had been refused, a vigorous attack was made on the east and northeast sectors of the fortress; this the Belgians repulsed. The 3rd Division, which bore the brunt of the first German onset, commenced its retirement on Aug 6 to join the main Belgian Army on the Gette. The Liége forts, however, continued their resistance to the passage of German troops. On the 12th, the German heavy artillery opened fire on these forts, the last of which surrendered on Aug 17.

Combined Operations Aug. 6-20. The first suitable defensive line in Belgium extended along the Meuse from Givet to Namur, thence northward along the Gette River. The Belgian Field Army, too weak in numbers to occupy this entire line, occupied the sector of the Gette only, awaiting the arrival of the Allied troops to continue the line to the south. The Belgian cavalry covered the left flank; the 4th Division remained at Namur.

German cavalry appeared before this line on Aug 10; cavalry skirmishes and outpost actions became general along the entire line. In the great onward move of the German forces, a brilliant episode for the Belgian arms was a forced march which resulted in the defeat of a German assault near Haelen. On the 18th of August, the situation had become critical for the Belgians. Eleven German corps were operating west of the Meuse; only one French corps was within supporting distance, near Namur; while the British forces were not due for several days. Orders were this day issued to retire in a northwesterly direction to the River Dyle. During this withdrawal, however, an enveloping movement of the II German Corps around the left flank was found to have progressed dangerously far, and a hurried retirement took place to the forts of Antwerp. This city, which had been the base of supplies of the army, was reached without serious loss on Aug. 20. Not until Aug. 24 did the Germans cross the French frontier, after a delay due to the tenacity and sacrifices of the Belgian Army.

The Defense of Namur. On Aug. 20 the German tide of advance first reached Namur; that night their infantry made three unsuccessful assaults on the northeast sector. But it was on their large-caliber guns that the invaders mainly relied: these opened fire on the 21st and continued vigorously until the last of the nine forts surrendered on the 25th. Belgian sorties and artillery fire had little effect upon the hostile lines. One by one the forts succumbed, with cupolas demolished. The 4th Division withdrew on Aug 23, and after some losses, reached Antwerp ten days later in good order.

Combined Operations Aug. 20-Sept. 27. The rôle now assigned to the Belgian army was to hold as large a German force as possible in the vicinity of Antwerp, acting offensively whenever advantageous to the Allies, and keeping open a line of retreat to the westward. Accordingly, several sorties were made from the entrenched camp at Antwerp; in particular, the Belgian offensive during the period Sept. 9-12 was so vigorous as to cause one German division to be recalled from France during the retreat from the Marne.

The Defense of Antwerp. The siege operations against Antwerp commenced on Sept. 28, when the German containing forces had been heavily reinforced in men and heavy artillery. The fire of the 42 cm. howitzers against the forts of Waelhern and Wavre Ste Catharine soon made itself felt, and these positions had to be evacuated the following day. In view of this destructive artillery fire, it was clear that Antwerp could no longer be considered a secure refuge, and should be abandoned by the Field Army before it was too late. Ostend was chosen as a new base, and thither were immediately transported the wounded, and all supplies. Precautions were also taken to guard the railroad to the west and protect the line of retreat. Meanwhile, the continued artillery fire of the besiegers was playing havoc with the cupolas and masonry of the detached forts. A determined general attack on Oct. 6 gained some ground against the main Belgian position north of the Nethe.

The Retreat to the Yser. A new danger now threatened the little Belgian army. By the first of October, the German right wing, in its northward retreat, had reached the vicinity of Lille, less than half as far from Nieuport on the sea as was Antwerp. The Belgians had to fear, therefore, not only the danger of being shut up in Antwerp; but, escaping that fate, they might yet be cut off from a juncture with the Allied forces. The retreat from Antwerp was begun during the night of Oct 6—none too soon, as that day the Germans forced a passage across the Scheldt. The most serious attempt to frustrate the withdrawal was thwarted by the opportune arrival at Ghent of supporting French marines and British troops. The retreat was continued until, on Oct. 15, the line of the Yser had been occupied, continuing the Allied line to the left.

In the meantime, operations against Antwerp were pushed, the bombardment of the city continuing until Oct. 9. Most of the garrison had been gradually withdrawn, including the three brigades of British marines. On the 9th the Germans entered Antwerp, and the formal capitulation followed next day.

The Battle of the Yser. The final chapter in this outline history of the defense of Belgium recounts the struggle along the Yser, which the Belgians occupied for some 22 miles from Nieuport at the mouth. Their army was now reduced to 82,000 men, and this force, with the aid of one French division, withstood the concerted efforts of seven German divisions, 150,000 men, to break through and turn the Anglo-French left. This German offensive was developed Oct. 18-30, and reached its height in the successive attacks launched against Dixmude and the bend in

EUROPEAN WAR—Continued

the Yser known as the Tervaete Loop. These attacks gained ground, but failed to pierce the Belgian line, now drawn in to a 12 mile front. Finally the Belgians inundated a section of their canal-netted country, and thus opposed an effectual barrier to the Germans. The Belgian losses were estimated at 14,000.

From whatever point of view these events be looked at, Belgium has at least the proud satisfaction of having scrupulously fulfilled every treaty obligation; and, through the valor of her army, having largely saved the situation in Western Europe during those critical days.

EASTERN THEATRE

May

By far the most important development of the month in the East was the offensive launched against the Russian position in the Carpathians by General von Mackensen. "In an engagement which will probably be known as the battle of Limanowa and as one of the grandest, bloodiest contests of this war, the Germans forced the Russians from the line which they held running nearly north and south along the Dunajec River," and crumpled up their right flank. Russian retreat followed the roads and railroads east from Tarnow, with the object of making a stand along the Wisloka River, twenty-five miles east of the Dunajec. But the Russian rout had been too complete, and the pursuing Austro-Germans forced the passage of the stream at Jaslo, and still swept on. Thus the rear of the troops occupying the Dukla Pass was uncovered; many of the Russians were captured, and the other passes to the east so seriously threatened as to compel the retreat of the forces occupying them.

"The initial successes when the battle opened along the Dunajec were attributed to the decided superiority of the Austro-German artillery; the rapid pursuit caused the loss of much of such artillery as the Russians had. Unless there is a strong reserve of artillery waiting beyond the mountains it will be almost impossible for the beaten columns to make a stand in the river country to the north. If we accept the figures of the Teutonic allies, the prisoners number 100,000, and if the casualties add 50,000 the loss in men is serious even for Russia. But while it will be possible to produce new men to replace those lost, it may prove very difficult to supply ordnance to take the place of that captured or destroyed. It is quite possible that the Russian troops have already felt the lack of sufficient reserve equipment, which would account for the failure to cover the retreat of the columns struggling to extricate themselves from the passes. It is noticeable that certain German military writers attribute the utter defeat of the Russian 3d Army not only to the valor of the Teutonic allies, but in part to a lack of rifle ammunition among the Russian infantry."

About the middle of May the Germans reached and crossed the River San, thus penetrating the critical terrain lying between that river and the Dniester. The forces which crossed the San between Sieniawa and Jaroslau drove their Russian opponents across the Lubacbowka River some ten miles north of Jaroslau, capturing 7,000 men and eight guns.

After a brief respite, on May 24, General von Mackensen resumed the offensive north of Przemysl, where his troops stormed several strongly fortified villages, as well as the hills northeast of Dobrosska and east of Cetula. More than 25,000 men and 153 officers were captured, in addition to sixty-four cannon and more than sixty machine guns, with fourteen ammunition wagons. The Russian casualties were very heavy.

East of the village of Radymno the Austro-Germans have forced another passage of the San, which brings their advance within ten miles of Przemysl, while a simultaneous attack by Austrian columns is gaining ground to the southeast of the fortress.

"While it is evident that this great attack has not yet reached its limit, it is even now apparent that General von Mackensen has achieved one of the greatest victories of the war. From the Dunajec to the San the Russians have been driven back nearly 100 miles, while further east, between the Carpathians and the Dniester, they have fallen back toward the north a distance of thirty miles. The Russians have lost all the mountain passes through which they were to have poured down upon the plains of Hungary. They have lost all the fruits of the hard campaign from November to May, except the fortress of Przemysl, which is in great danger. It is now apparent that the best Russia can hope to accomplish will be to extricate some effective remnants of those forces which swept triumphantly into the mountain fastnesses after the fall of Przemysl. The terrain does not permit the construction of a series of supporting echelons, and consequently the retreat, more or less headlong, has allowed unusually large booty in both men and matérial to fall into the hands of the victors. Fortunately for Russia the northern port of Archangel is now open and with the relief from the ice blockade it is anticipated that large shipments of foreign munitions will find their way to the scene of the fighting at the other extremity of the empire."

Of far less importance than the Carpathian campaign, but still significant of German enterprise and hopes, was the German offensive around the Russian right into the Baltic province of Kurland. This dash, which developed early in May, appeared at first to be merely a reconnaissance in force. The invading force, however, after cutting the railroad lines west from Vilna and Dvinsk, and frustrating the Russian attempt to cut their line of communications, appeared before the important Baltic port of Libau. After a well-planned combined assault by land and sea, the city was captured during the second week in May. "Large quantities of war materials fell into the hands of the Germans. The Russians succeeded in stopping the invaders before Mitau, one hundred miles inland, but failed to prevent the

destruction of the railway line between Vilna and Saarle."

The end of the month has seen further engagements, favorable to the Germans, near Roscynic, on the Dubysa River, and farther south towards Kovno.

"With Libau strongly held by the Germans, it will be increasingly difficult for Russia to repeat the effort of last autumn to threaten Königsberg, and the position of the German left in the Baltic provinces is much strengthened. The situation grows temptingly favorable for an attempt to roll up the Russian right flank along the line of the Niemen. A German army astride the main railway connecting Warsaw with Petrograd would need to be driven off before Russia could again threaten either Germany or Austria."

Simultaneously with von Mackensen's sweeping advance, the Austro-Germans attempted a less successful attack against the Russian left in the Carpathians toward Lemberg and Tarnopol. After some preliminary successes, the Austrians were checked south of the Dniester. Then followed a vigorous counter-offensive, resulting in a considerable local success for the Russians, and the reported capture, on May 15, of 30,000 Austrians. This attack, however, seems to have been nothing more than a strong effort to relieve the pressure on the defeated army which was endeavoring to escape from the Germans; the victors have not followed up their advantage.

"There have been unofficial reports of Russian successes in the Caucasus, which, until officially confirmed, are not to be taken seriously."

June

With the loss of Przemysl on June 3, Russia saw swept away the fruits of her one substantial advantage gained during the war. Ten weeks before this stronghold had yielded to the Russians after a six months' siege. Twenty days sufficed von Mackensen's victorious army to recapture the city. The Russians, however, had not repeated the Austrians' mistake of allowing a large garrison to be shut up in the town; their force comprised probably less than 20,000 men. This small garrison had seen their enemies closing in rapidly, north, west, and south. Fifty miles to the southeast the Austro-Germans won an important victory and took the important town of Stryj. To the north of Sieniawa on the San the Russians were equally unsuccessful in checking the German drive. When some of the outlying forts fell, it became apparent that the great fortress could not duplicate its previous long resistance. Reports indicated that it held out as long as its supply of ammunition lasted; to this deficiency of ammunition its speedy fall is attributed.

The second week in June saw no pause on the part of the Austro-German forces. Moscisha, fifteen miles east of Przemysl, fell into their hands after a week's desperate resistance, while another force reached Stanislau, 75 miles to the southeast, and threatened to sever all communication between the Russian armies in Bukowina and in mid-Galicia. The resistance of the Russian forces along the line of the Dniester was very stubborn. Vienna claims to have captured during these first two weeks in June 122,300 men, 108 officers, 53 cannon, and 187 machine guns. The totals for May, according to Berlin, were 269,000 men and 863 officers captured.

Meanwhile in the Baltic provinces the German forces had made substantial though comparatively inconspicuous progress. The Russian line, having fallen back 40 miles east of Libau, was making little effort. The important town of Shavli was being approached by two German columns. Other German gains were reported at Kovno, south of the Niemen.

In the third week these German advances near Shavli were checked and her columns thrown back by the arrival of strong reinforcements from Russia's unlimited supply of men. It was only a temporary halt for the Germans, however; there followed reports of 4000 Russians captured near that town, and 3000 more south of the Niemen. West of Warsaw, too, a strong German attack developed along the line of the Rawka—a threat which seemed less a direct attack than an effort to prevent the despatch of troops to either of the hard pressed flanks north or south.

This week was marked by a period of comparative inactivity in Galicia. Both Generals von Mackensen and Linsingen were evidently pausing to consolidate their lengthening lines of communication, and to safeguard their flanks. After this pause the advance toward Lemberg was resumed, Rawa Ruska to the north of the doomed city and Grodek, to the southwest being the point first threatened. The first attempt of the Austro-Germans to cut their way through by way of Grodek, on June 17, was reported by the Russians to have been repulsed. But after that events moved rapidly. Von Mackensen continued to sweep eastward, his left almost brushing the Russian frontier, while Linsingen from the south hammered at the strongly held line of the Dniester. On the 21st, Rawa Ruska, north of Lemberg on the railroad, was occupied by the Germans, and it became a question of choice for the Russians between a retreat and a disastrous envelopment. They lost little time, and on the 22d, before the Teutons' advance had fairly reached the city, they quietly evacuated Lemberg and retired on Brody. Vienna claims the capture of 60,000 men with Lemberg, together with a quantity of heavy artillery that the Russians can ill afford to spare.

Von Mackensen's exploit is the more remarkable inasmuch as his army and Linsingen's, operating necessarily on exterior lines, never effected a juncture. If the Russians could have mustered sufficient strength to rout their opponents on the Dneister, they might then have swung overwhelmingly against the other army. But their enemies' plans were well conceived, and the Russians

EUROPEAN WAR—Continued

hopelessly outmatched. The Teutonic allies are said to have numbered 4,000,000 men altogether in Galicia; and more significant still was their immense superiority in guns and ammunition supply.

But the Teuton task was not complete with the capture of Lemberg, and as if to offset in some degree this great victory, there came immediately afterwards the news of an Austro-German check on the Dniester east of Halicz, where the stubborn defense of the Russians had finally forced back a hostile army that had crossed the stream. Here the Teutonic advance was fairly halted, and in the last week in June, the Russians, in their strong position on the north bank of the river, had been able to frustrate all efforts of the two German armies to unite.

July

A month ago, with the fall of Lemberg, the German offensive might well have been content to halt. Petrograd saw in the stand that the Russians momentarily made at the Dniester the counterpart of the Marne on the western battle front. But Germany's efforts were not spent. The tide of von Mackensen's advance rolled on east and north; fresh German forces invaded Courland, captured the important port of Windau on the Baltic, and struck southeast at the railroad lines running into Poland. And the question that now confronts the Allies is "How long can Warsaw escape?"

Following the fall of Lemberg and the Teutonic successes in that vicinity, a rather remarkable situation developed in this corner of Galicia. While the Germans had been pushing back the Russian right all the way from the Dunajec to Lemberg, a large Austrian army had been heavily engaged in driving the Russian left from the Carpathian passes back across the Pruth, and finally, after stubborn fighting, across the Dniester, some forty miles in all. But this Russian army showed remarkable courage and initiative. Early in May, while the right wing was fighting on the San, they had delivered one counter attack which for a time held back the Austrians. And now when Stanislau was captured, the Dniester crossed, and it seemed that only a rapid retreat could save them from being enveloped from two sides and crushed, they turned once more in a vigorous counter-attack, and near Martinow forced back across the Dniester von Linsingen's victorious force, which was advancing after the capture of Stryj.

"Viewing this sector in the light of all the news available," says the *Army and Navy Journal*, "it appears that this part of the Russian army has shown fighting qualities in rear guard actions greatly superior to the center and the right wing."

"Following these Russian successes, Gen. von Linsingen's army resumed the attack, and after capturing Halicz swept back across the Dniester. The high banks and deep, rapid river presented great difficulty. One Prussian regiment stood breast deep in the stream all day waiting an opportunity to win a place on the Russian side. Under cover of night and an early morning mist the crossing was finally effected and the city of Bukaszowice was taken."

"This brilliant victory compelled a general retreat of the Russians toward the east through the country north of Mariampol, and eventually across the Zlota Lipa, another of the nearly parallel northern affluents of the Dniester. The Austrians took thousands of prisoners in this sector, as well as a number of machine guns, whose loss must be severely felt by the Russian infantry.

The German pursuit continued along the entire front between Halicz and Firjelow, the Russians retreating across the River Bug. Tomasof, in Russian Poland, was soon reached and captured. The following week saw no let up in the pursuit. One strong column moved north through Krasnik toward Lublin and the fortress of Ivangorod. Another force, the same one that captured Tomasof, fought its way across the Por and Labunka Rivers, keeping abreast of the Krasnik column. Thousands of prisoners were captured in this sector, which has no railways and must present serious difficulties to the transport of the widespread line with which Gen. von Mackensen is sweeping northward on a front of fully 150 miles.

In the meantime there had been additional evidence of a German offensive against Warsaw in the increased German activity on the north. Strong reinforcements of artillery were received by the Germans in the sector between the Omulew and Orzyc Rivers, and the Russian lines drawn in closer in this region. Far to the north, in the fighting about Shavli, there was evidence of a fresh German offensive toward Windau, the only important port in Courland left to the Russians. Fresh color was given to this report by the naval action off Courland between Russian and German squadrons, in which a German mine layer was forced ashore on the island of Gothland, and several German fighting ships were reported to have returned to Kiel badly damaged.

The third week of July saw the fall of Przemysl, in northern Poland, and other minor German successes in this region, including the capture of 2000 prisoners south of Kolno. On the other hand, the Krasnic column suffered a serious check. After breaking through the Russian line at Krasnic, the Austrian Archduke exposed his right flank to a well-delivered counter-attack by the Russians, some twenty miles south of Lublin. This blow to the Teutonic advance gave Warsaw some temporary relief from the enveloping movement, and demonstrated the survival of a good fighting spirit in the discomfited Russians.

But the end of the month saw no signs of lessened power in the Teutonic armies, victorious from the extreme north at Windau all along the 450-mile line to Galicia. Not only the port of Windau, but the town of Tukkum on the railway to Riga, second northern

port to Petrograd, fell into their hands. Around Warsaw the German columns seemed to be converging with machine-like precision. Von Hindenburg on the north and von Mackensen on the south were operating the two jaws of the pincers. The former controls the railroad north of Warsaw, is operating vigorously against the Russian position on the Narew, and is already at the gates of the fortress Novo Georgievsk, only twenty miles from Warsaw. The latter's advance is abreast of the Radan-Ivangorod line, and his further advance must compel the Russians to seek new lines of retreat across the Vistula.

At the close of the month, the fall of Warsaw seemed to be only a question of time. Petrograd had frankly admitted that the shortage of munitions would permit of no serious resistance for the time being. There was no lack of *men* to oppose the Germans, but the recruits and reserves were for the most part without rifles. It seems not improbable that Warsaw will be evacuated shortly.

"Austrians have made another advance across the Dniester far to the east in the Bessarabian region, where political effect in the Balkans is important. Roumania's alleged reluctance to permit the passage of munitions directed to Turkey would give reason for a strong demonstration here if Austria could manage it."

The close of the month brings reports of a determined Russian stand along the Narew and at the Lublin front. Whether this is more than a temporary check to the Teutonic advance cannot yet be determined.

Aug.

In order to follow with any degree of clearness the ever-shifting lines on the eastern frontier, it is necessary to keep in mind the German plan of campaign. This has not been to capture Warsaw, or Brest-Litovsk, or any other one point, but to defeat decisively the Russian army. It was hoped that the position in the Polish salient would permit of the envelopment and rout of the forces of Nicholas. Thus the great drive of von Mackensen across Galicia and into Poland, and the movement in the Baltic provinces, which appeared for months to be an entirely separate attack, were co-ordinate parts of the same vast plan,—to strike south and north at lines of communication, to cut off Russian retreat, and to complete the Russian overthrow. The execution of this plan has been as brilliant as its conception was sound. The Teutonic columns have moved on with masterly precision; the supply of this vast army has been a marvel of railroad and automobile efficiency; powerful guns, of the type that reduced Antwerp, have been brought up where necessary, as at Novo Georgievsk, and have prevailed against the fortifications. During August, practically all the strongholds on the Russian first and second lines have fallen.

On the morning of Aug 5, the Kaiser's Bavarian troops marched into Warsaw. The Russians had stripped the city of military supplies, laid waste the county in their retreat, and opposed only such resistance in the form of rear-guard actions as enabled the main army to make good its escape. The jaws of the pincers had failed to close on the prey, though the great fortress and the city, the third city of Russia in size, constitute a prize of great value.

The army of von Mackensen had by this time reached the neighborhood of Lublin and Chelm, thus cutting the railroad line southeast from Warsaw toward Kiev. The following week saw the fall of the great fortress of Ivangorod, on this same line. The troops who successfully assaulted the fort crossed the river by means of heavy pontoon trains, loaded with troops, and floated down the river at night into place.

In the north the Germans advanced more slowly, the Russians making a determined resistance at Kovno. Their line now included the key-points Riga, Kovno, Grodno, Bielostock, Brest-Litovsk, Kovel. On the extreme north a strong German fleet, including nine battleships, made an unsuccessful attack on Riga. Several of the lighter ships were damaged in trying to force a way through the mine field in the channel.

On August 18, after two weeks of desperate resistance, the fortress of Kovno was captured by the Germans, who claimed with it to have taken 20,000 prisoners and "innumerable quantities of material, including more than 400 cannon." This opened the way to Vilna and the main railroad line between Warsaw and Petrograd. The Russian forces guarding Riga continued a strong defense. Russian activity in this sector has caused not a little speculation as to the possibility of a German campaign against Petrograd, 350 miles distant across a country of lake and swamp and fen.

Just one day later, the last fortress of the first line of defense succumbed. In Novo Georgievsk, the evacuation which had been planned was prevented by the breaking of a railroad bridge, with the result that a garrison was left in the city. These troops made a desperate defense, and enabled the fort to hold out for several days. Its final capture seems to have been chiefly due to the 42 cm. howitzers and other powerful guns in the Teutonic siege-trains, under General von Beseler. When they had completed their work at Novo Georgievsk, these units moved on without halting toward Brest-Litovsk. Berlin claims the capture of 85,000 prisoners and 700 guns.

Bielsk was captured on Aug. 20 by Gen. von Gallwitz, and with it 3500 men. The next fortress to fall was Ossowetz, which occupied a salient in the Russian line; and which the Germans had been attacking for some months. The surrounding swamps had made it impracticable for the assailants to use their heavy artillery, but now on Aug. 22, almost surrounded in the general advance, the garrison abandoned the works. Kovel, at the southern end of the Russian second line, fell on the following day before von Mackensen's advancing column.

The fate of Brest-Litovsk was already sealed. Three columns had been closing in on

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this strong-hold, one of Von Hindenburg's columns from the northwest, which fought its way across the Bug River near Drohiczyn, an Austrian army under the Archduke Joseph Ferdinand from the west, and von Mackensen's own army, which had fought its way up from the south. The end came with surprising quickness, considering the strength of the works. On Aug. 25, German and Austrian troops stormed the western and northwestern fronts, and that night entered the enceinte. The Russians thereupon evacuated this city, according to the Berlin War Office; and are believed to be retreating eastward and northeastward. The retreat was no doubt necessary to prevent the cutting off and capture of the garrison, as the only railroad left open, that to the east, was already threatened. The capture of Brest-Litovsk leaves the Russians without a field base of sufficient size to serve for the operations of the field armies. No other Russian city possesses equal railway and natural advantages nearer than Moscow or Petrograd. Brest-Litovsk stands at the confluence of the Bug and the Mukhovets River, 118 miles east of Warsaw. It is the intersection point of railways from Odessa, Kiev, Moscow, Warsaw, Vilna, and east Prussia, and hence is of tremendous strategic value.

Prince Leopold's army in the region east of Warsaw has been fighting and gaining steadily. Over 10,000 prisoners have been captured in three engagements, and the advance continued toward the railroad north of Brest-Litovsk. The fall of the latter left Grodno the only point not captured on the second line. The third line, to which the Russians must now retreat, runs through the country known as "White Russia," and includes Dvinsk, Vilna, Lida, Baranovichi, Pinsk, and Rovno.

During the last week in August came the report of a considerable naval engagement in the Gulf of Riga. At first it was claimed that the Russians had sunk several German battleships and that a British submarine had torpedoed the German superdreadnought *Moltke*. Although the report was official, later reports of the same engagement were characterized by an indefiniteness that leaves in doubt exactly what did happen as far as the naval engagement itself is concerned.

One fact is apparent, however. The Germans attempted to land under cover of the guns of their warships a large force of troops, evidently intended to reinforce the army operating in Courland. Whether this is an indication that the Germans in this section are about to institute a more extensive offensive has not developed. The Russian shore batteries effectively prevented the landing, so, whatever the object may have been, it has been, for the time being at least, defeated. Subsequent Russian reports state simply that the German fleet has left the Gulf of Riga.

Sept.

In regarding the shifting lines on the eastern battle front, it is helpful to keep in mind the outline of the entire campaign and Germany's underlying objective. After the check at the Marne to the German western offensive, and Austria's failure to carry out her part of the program in taking care of Russia, there followed the second great phase of the war, Germany's attempt to force a decision against Russia, while holding off her adversaries on the west. This phase is now nearing completion. The German plan reckoned rightly on the inability of the Anglo-French forces, with their then strength and equipment, to carry her entrenched lines. German achievement on the eastern battlefields has been prodigious, her captures of men, material, and territory of tremendous military value and significance. Whether or not she can claim a decisive victory over the Russian arms is another story. In view of the latter's unlimited resources of men and territory, in view of the saving Russian policy of retreat and the skillful extrication of the Russian armies from their threatened envelopment, in view of the heavy cost to the Teutons in numbers and their ever-lengthening lines of communication, present indications denote that the invaders have fallen short of that measure of success which they needed and thought to attain.

It is worth while noting, in this connection that Russia had long since recognized the weakness of the Polish salient, and had contemplated the possibility of abandoning it in the early days of the conflict. In planning her second line of defense through Brest-Litovsk a few years ago, she announced that her mobilization would take place on that line,—a plan which was subsequently modified in favor of a more advanced mobilization center. When, therefore, her early advantage lost, she found her Warsaw apex attacked from both sides, the two main railroad lines to Petrograd and Kiev seriously threatened, Nicholas lost no time in getting his main army out from between the jaws of the vise that von Hindenburg and Mackensen were attempting to close on him. The retreating Russians scarcely hesitated at the second line, it is true,—further withdrawal was necessary to escape the rapid enveloping movements of the German hosts. By the end of August Grodno was the only stronghold in this line that remained untaken. On Sept. 2 the evacuation of this fortress, which was a foregone conclusion, was announced. Meanwhile the Teutonic forces were making fresh headway, von Hindenburg at the north toward Vilna, Prince Leopold with his Bavarians at the center of the line toward Slonim and Minsk, and von Mackensen farther south into Pinsk, which he captured without serious opposition. The extreme flanks of the Teutonic advance encountered the most stubborn resistance. For some weeks little progress had been made toward Riga, at the northern end; now to the south, after losing Lutzk, this wing of the Russian army turned in a powerful counter-offensive near Tarnopol, in eastern Galicia, and inflicted a series of defeats upon their Austrian opponents, in whch they claimed the capture of 40,000 prisoners. In this section the Russians are particularly strong, while the Teutonic flank seems to have

been weakened in order to strengthen the northern offensive.

The third week in September was marked by the fall of Vilna,—perhaps the most important German success since the capture of Warsaw; there for a time the Russian army under General Russky was in grave danger of being captured, for German troops had gained the railroad lines north, east, and south of the city, and thus practically surrounded their long-sought prey. But by the fiercest kind of fighting the Russians recaptured the railroad running eastward to Minsk, and fell back along this line, with inconsiderable losses.

The main German objective in this region is now apparently the city of Dvinsk, a hundred miles to the north on the railroad toward Petrograd. The Russian position along the Dvina, however, is held strongly, and German progress is slow in this direction. Nor has Leopold's force, which is engaged near Slonim, made rapid headway toward Minsk. General von Mackensen, after advancing somewhat beyond Pinsk into the Pripet Marshes, reported that he had to withdraw his lines somewhat to avoid too advanced a salient. At the south end of the line, the recapture of Lutzk by the Russians has been to them a welcome offset to German success elsewhere; the Lutzk-Dubno-Rovno triangle is now practically cleared of Teutonic forces. On the whole, despite the fall of Vilna, the situation looks more hopeful for Russia than for several weeks.

Oct.

It is the misfortune of Duke Nicholas that most of the fruits of his Fabian policy have been reaped since his departure from the main Russian Army. The dynamic force that blasted its way through Poland is fairly spent. And despite the vast area of territory acquired, the outcome of the eastern campaign is an unsatisfactory one for the Teuton arms. At every point the Russian army eluded capture and for the most part made good its retreat; each stronghold that the Teutons entered they found a deserted, denuded spot (except Novo Georgievsk). The natural allies of the Russians,—the rainy season, the marshes, the lengthening of communication—have helped to check their advance. As their supplies of heavy artillery ammunition become diminished, the Russians meet them with the rifle, more nearly on even terms. At last their advance is halted,—and halted on a line which is not at all a favorable one for entrenching, on account of the lack of lateral railroad communications. Far in advance of the north and south line through Brest-Litovsk, the Germans have failed to gain the next parallel railroad, that runs from Riga through Dvinsk, Lida, to Rovno; and the Russians are in full control of this invaluable supply line except in the neighborhood of Vilna.

For the first three weeks of the month, the German offensive centered about Dvinsk, which was their logical objective after Vilna. Step by step, von Hindenburg drew the lines closer to this important city, until its fall seemed imminent. But Russian resistance stiffened, and the German objective, in apparent acknowledgment of failure, has shifted once more to Riga. This city is strongly located on the east bank of, and at the mouth of the Dvina. There is no favorable crossing nearer than Friedrichstadt, 60 miles up the river, which the Germans hold; and the country between these places is almost impossible for military operations,—thickly wooded, marshy, with scarcely a road in any direction. The German army in this neighborhood is strong and active, but is not making much headway against the able Russian resistance. One column is working east from Mitau, about 30 miles from Riga.

Field Marshal von Hindenburg is criticised for not having concentrated his efforts on taking Dvinsk several weeks ago. Says the *Army and Navy Journal:*

"So far as the strategy of the campaign in Courland can now be judged, it seems that the advantage rests with General Russky, who has managed to prevent his adversary from concentrating his early attacks upon the key to the position (Dvinsk), while with great skill he robbed him of the booty whose prospect lured him into the delay at Vilna. Late German summaries of the results at Vilna give the number of prisoners taken by General von Eichhorn's army as seventy officers, 21,908 men, three cannon, seventy-two machine guns and large quantities of baggage. These captures, while important, nevertheless show that the bulk of the Russians escaped after Vilna."

Russian cavalry operations against the German lines farther south have met with such success as to indicate that this sector of the German front is thinly held, having probably been weakened to reinforce the northern offensive. At the southern end of the line, in Galicia and along the Rumanian border, the Russians have continued to be particularly aggressive, and have shown flashes of the same driving ability that their troops displayed a year ago in this neighborhood. They claim the capture of 125,000 Austrian prisoners in these operations of the last few weeks. Germany for her part claims to have captured 96,000 Russians during September.

"There has been violent fighting west of Trembola and Tarnopol, where heavy Russian attacks were defeated. On the Kormin brook and the lower Styr several battles seem not to have yielded advantage to either side, but the Russians scored a brilliant victory at Czartorysk, where they took 700 prisoners of the 1st Kronprinz Grenadiers. General Ivanoff is the aggressive Russian commander in this far southern sector, and it is possible he may make another drive at Czernowitz, the capital of Austrian Bukowina. This place has changed hands frequently within the year, and is politically important because of its proximity to Rumania.

Zeppelins have dropped bombs on the Remersh railway line north of Friedrichstadt, and have also bombarded Russian positions near Dvinsk. Another attack was directed against the station at Minsk, where Russian troops were entraining.

The long German line in Russia now extends approximately from Riga to Dvinsk, following the course of the Dvina River. From

EUROPEAN WAR—Continued

Dvinsk it drops nearly straight south to the middle of the fortified triangle Lutsk-Dubno-Rovno, more than 500 miles from end to end, exclusive of the positions further southeast in Galicia and Volhynia, on to the Rumanian frontier; a total length of about 700 miles."

Nov.

On the eastern front, the offensive rôle is gradually passing from the Germans to the Russians. In the north, to be sure, the campaigns against Riga and Dvinsk have not been abandoned, but they make little headway. Elsewhere along the line, the Russians are the aggressors. Seeking to pierce the line which their opponents have admittedly weakened, they have achieved local successes, without having broken through anywhere.

At the north end of this line, the attempt to take Riga reached its climax with the capture of Olai, on the Mitau-Riga road, and scarce a dozen miles from the latter city. But further progress across the marshy country beyond, crossed only by a single road, proved impracticable, and the attacking force was compelled to retire. The city has proved equally impregnable to attacks from the west, based on Tuckum, and from the southeast, along the Dvina. Russian vessels have lent their supporting fire to the operations along the shore of the Gulf of Riga.

Late in October, von Hindenburg won an important advance toward Dvinsk in the capture of Illukst, some ten miles northwest of the former city, together with 4000 prisoners. Thereafter for a time, the fighting centered about Lake Swenten, west of Dvinsk, where the Russians won a long, savage battle. The attackers were compelled to abandon their efforts from the south, and to withdraw their lines west of Novo Alexandrovsk. Marshal von Hindenburg found himself on the defensive in this region, with the Russians constantly attacking his lines, and winning minor victories. Late in the month, however, reinforcements were reported to be arriving in the German camp. A new road has been built for the transportation of their munitions, and large supplies of ammunition forwarded to the German bases. For their part, the Russians are now also abundantly supplied with an ever-increasing store of munitions.

Farther south, on the Styr River, General von Linsingen's army has been hotly engaged in the vicinity of Czartorysk, which has changed hands several times, with varying fortunes of war. Another long-drawn-out battle was fought near Sienikowce, on the Stripa, which finally resulted in an Austrian victory, the town remaining in their hands, together with 6000 prisoners. Despite this reverse, the Russians have on the whole continued to make progress in Galicia. North of Tarnopol, they took nearly 8000 prisoners and two howitzers. As the month closes, they are reported to have recaptured Czernowitz, capital of Bukovina, after a four-day battle.

A Russian report for the past month (October) claims the capture, along the entire line, of 50,000 Austro-Germans and 21 guns.

NOTES ON OPERATIONS IN THE EASTERN THEATER

[Consequence of Russian Resistance in Galicia. By Colonel Juan Avilés, Spanish Engineers, *La Guerra Europea*, July 9, '15. 1300 words.]

Strange as it may seem, there are plenty of critics who, in good faith, praise and find admirable the Russian operations in Galicia. Their principal argument is that the determined resistance of the Russians weakens the Austro-Hungarian troops. But this is regarding the Russian army as if it were a mass destined solely to die fighting, without any obligation with respect to its own country. This sort of criticism likened the Russian army at first to a steam-roller and now compares it to a gnawing tooth. But when the English, French and Belgians are held for months by troops inferior in numbers, the best way to aid them is certainly not to invite the Russians to strain their energies to the point of exhaustion.

It is an axiom in war that, if the situation is adverse and irremediable, it is better to break off the struggle and to retire, with a view to fighting again in more favorable circumstances. In retreats are manifest the morale, the discipline and the soul of an army. And there is none like the Russian for bearing up under reverses. But its generals have abused these excellent qualities.

With the fall of Przemysl and the deployment of the Austrians and Germans on the right bank of the Dniester, the Galician campaign was lost to the Russians. Lemberg should have been evacuated by them in the early part of June and the whole army should have fallen back to defend the section between the Vistula and the Bug. Such a maneuver would have reflected credit on the talents of General Ivanov, but instead he extended his left flank as far as the Roumanian frontier and committed the perhaps greater error of attacking the enemy's troops to the south of Lemberg, believing that his feeble right wing could contain the victorious army of von Mackensen. As a result, all the towns, defenses, rivers, communications and important points that he could have abandoned gradually were taken from him by force and his troops are already only fragments of that immense army which had crossed at various points the barrier of the Carpathians.

It must be recognized that the conduct of Ivanov is typically and genuinely Russian. It can be understood why the French critics praise him, although military principles condemn him. But General Joffre has not operated in the same way.

The Russian army seems to be deprived of the faculty of movement. Its cohesion is so great that it continues to escape final disaster, but it continues to pile up defeat on defeat and is rapidly becoming useless for anything more than passive resistance. In no other manner can it be understood that a ten months' campaign has been sufficient to dissolve and break an army of seven or eight million men. It would perhaps be intact if, instead of seeking adventures for which it was not prepared, it

had developed a campaign more in harmony with its national interests and with its strategic lines of resistance. The severe criticism of which Kuropatkin was the object on account of his predisposition to order the retreat, may have contributed to make the present generals prolong resistance far beyond prudent limits and to make them the victims of almost unparalleled disasters. Extremes are vicious, and one should have ever present what the situation and who the adversary are, elements of judgment which do not appear to have weighed much with the Muscovite leaders.

THE SOUTHERN THEATER

May

Says the *Army and Navy Journal* of Austro-Italian operations:

"From the standpoint of strategy Italian intervention should be immediately important in three well defined directions.

"First: Austria has had safely sheltered at Pola a fleet which if free from Italian menace might have become a serious danger to the transport service traversing the Mediterranean from French and English depots to the Gallipoli peninsula. Blocking the exit of the Adriatic has been a duty of considerable importance and must have occupied some strong naval forces from either the French or the British fleets. The Italian navy will certainly relieve the Allies of this duty.

"Second: It is to be expected that Italian troops will be despatched from Naples to participate in the fighting at the Dardanelles. Italian statesmen will want a prominent place in the council which finally disposes of the great Eastern outlet of the Mediterranean Sea and their position will be strengthened if Italian blood has been shed on the shores of the Dardanelles.

"Third: The thoroughly well equipped and organized Italian army will demand the diversion of a large army of German and Austrian troops to prevent a rapid and dangerous incursion into Austria across the central part of what the Austrians called 'Kustenland,' whose southern section is the celebrated peninsula of Istria. If an impetuous attack can throw the Austrian frontier forces back as far as the Julian Alps, an advance of not more than twenty-five miles beyond the frontier, the way will be open to threaten from the rear both Trieste and Pola.

"Trieste is only some twenty miles to the south of the frontier, and it has railroad connections with Pola, fiftv-five miles away, at the southern tip of the peninsula. While the interior would be difficult, being a heavily wooded, mountainous region, the coast is low and would offer few obstacles to a force which had either captured or pushed around Trieste. If Pola can be taken there would seem to be little chance of escape for the Austrian navy, especially if the French and British Mediterranean fleets could spare a few heavy ships to aid the Italian navy, which is more than on a par with Austrian fleet.

"The inhabitants of the towns along shore are intensely Italian in their sympathies, while the people of the hills are Slavs and bitter enemies. There is certainly great need for a strong defensive force of Teutons to save Trieste and the country to the south from an attack, which would not only win for Italy the long coveted Istria, but which would also mean ruin for the Austrian naval establishment. A strong Austrian offensive from Trent might threaten the rear of the Italian army of invasion.

"The first blows were struck by Austrian airmen and ships, which united in a raid upon various towns for a distance of 350 miles along the Adriatic shores on May 24. The government arsenal at Venice was the target for aeroplanes, which also dropped bombs upon Porto Corsini, Ancona, Gesi, Potenza, Barletta and the Tremiti islands. A number of light Austrian warships participated in the raid and the bombardment of Ancona lasted two hours, resulting in considerable damage to the railroad.

"Austrian artillery shelled Italian outposts on the river Adige, in front of Rivoli, at the point where the Austrian frontier makes its deepest dent in Northern Italy.

"The following day Italian forces invaded Austria in the direction of Trieste, occupying the heights between Idria and the Isonzo River, where they encountered only feeble resistance. The Austrians withdrew from several villages, destroying bridges and houses. The Italian offensive, which is extending from Switzerland to the Adriatic, has resulted in the occupation of frontier posts with very light skirmishing."

June

The Italian troops invading the mountainous province of Trent found their difficulties increased by the heavy rains that had swollen the rivers. This invasion developed in two columns, one through Tonale Pass, close to the Swiss frontier, and directed toward Neumarkt, on the railroad north of Trent, the other toward Condino, southwest of Trent. A number of villages close to the border were taken with but little resistance on the part of the Austrians, who fought what appears to have been merely delaying actions. The capture of Monte Baldo, between the Adige and Lake Garda, was accomplished by a surprise night attack. Some of the fighting has occurred in deep snow.

During the succeeding two weeks, there were few developments in this region. Artillery duels were frequent among the moun tain valleys; but the Italians seemed content to hold the passes seized at the beginning of hostilities without pressing on. The Ausrians had meanwhile prepared a strong defensive position across the Adige south of Rovereto; dynamite being freely used to open fields of fire, to block the narrow roadways, and in some cases to precipitate avalanches upon bodies of the Bersaglieri.

This Italian inaction in the Tyrol seems to indicate an intention merely to contain the Austrian forces here while the really important offensive develops farther east. Here on the line of the Isonzo the Italian advance covered a front of 50 miles, from Caporetto to the sea. Accounts of the crossing of the

EUROPEAN WAR—Continued

Isonzo reflect much credit upon the initiative and fighting qualities of the Italian cavalry, displayed in covering the work of the engineers in building pontoon bridges for the crossing. The capture of Monfalcone, early in June, was followed by the fall of Gradisca, a few miles northwest of the former place and on the railway to Goritz. A day later Porto Rosega, south of Monfalcone, was taken, so that the Italian right flank appears to rest secure on the shore line at the north end of the Gulf of Trieste. This provides a secure pivot on which the army of the Isonzo can make its turning movement toward the south if the Austrian positions from Goritz north are taken, its right flank well covered by the powerful Italian fleet. On the 17th the Italians reported the capture of the heights around Plava, on the east side of the Isonzo. Hard fighting was going on near Tolmino; and progress was also reported against the Fortress of Malborghetto, a troublesome obstacle to the Italian advance toward Tarvis. This latter city, opposite the northeast corner of Italy and on the oft-travelled route of invasion toward Vienna, is attracting increased prominence as being perhaps the main Italian objective rather than Trieste. Italian forces are reported advancing in this direction through the Predil Pass, and their heavy artillery commands the valley below.

There is reason to believe that the sector east of the Monfalcone—Gradisca line will be strongly defended by the Austrians on account of its strategic importance. There are numerous old stone quarries here which would provide ideal positions for heavy artillery, and the Italian reconnaissance has discovered an elaborate system of intrenchments in successive lines, some built of masonry and concrete.

Austria, for her part, was reported late in the month to be active in the Tyrol. There were indications that, spurred by the reported censure of the emperor, Francis-Joseph, an Austrian army was preparing for a descent upon Italy, which might hope to break up the Italian movement to the east.

There have been no naval encounters of note during the month. Monfalcone was several times bombarded, previous to capture, by an Italian destroyer flotilla. The airships of both combatants have been active, and raids have been attempted, with varying degrees of success, upon Venice, Fiume, and Pola. The Italian government has confiscated in Italian ports fifty-seven German and Austrian vessels, with a total tonnage of over 200,000.

Servia, which has not been heavily engaged since December, is said to be preparing to launch fresh attacks against Austria when the latter shall have become deeply involved in her Italian campaign.

July

In the Austro-Italian campaign, the second month has failed to disclose any decisive gain for the Italians. General Cadorna finds his plan of campaign still in the primary stage—which appears to be to threaten Trent, while pushing his main attack toward Trieste. Near Goritz the Italians claim to have met German troops, and unconfirmed rumors report the arrival of several divisions of the latter in southwestern Austria.

Along the Isonzo, Gorizia and Malborghetto have been the central points of disturbance. At the former place several unsuccessful assaults were made by the Italians on a bridgehead, while a desperate indecisive battle was fought nearby at Sagrado. The attack on Malborghetto, important on account of its location on the route to Tarvis, has been assuming the nature of a siege, with a steady but not particularly effective bombardment. The town, well fortified as it is, seems to be in no immediate danger of being captured. At Caporetto, farther north, the Italians have made some substantial progress toward Tolmein. East of Monfalcone, they have been active also; in short, they are endeavoring to push home their attacks all the way from Tarvis to the Adriatic. The obstacles, however, appear to be more serious than anticipated, and the strong Austrian line, utilizing the natural obstacles of grotto, cave, and gallery, is thus far impregnable.

In the Tyrol an unusually severe July has hampered operation; the snow is unusually deep and the streams swollen; and Italians have come back from those regions of perpetual snow with severe frost-bites.

In the advance toward Roverto, the fortified town south of Trent, the Italians scored a brilliant little outpost victory on the side of Monte Monticello. A detachment of the Alpini succeeded in surprising an Austrian outpost by a combination of mountaineering and fighting skill. Riva, a town on the western side of Lake Garda, is said to be threatened by Italian infantry. The Austrians in the Tyrol have recently shown increased activity and launched rather vigorous counterattacks against Italian positions in the mountain passes to the west.

The close of the month brings rumors of the evacuation of Gorizia by the Austrians.

Aug.

On the Austro-Italian front, events have been practically at a stand still. Against those formidable Alpine lines, for which the Italians have so much respect that they see in them the work of an omnipotent military engineer, their assaults have made little progress. Aided by these natural obstacles, the Austrians, some 400,000 in number, have been able to hold in check an army twice as large.

On the Isonzo front, the Carso plateau has been a storm-center during the month, the Italians having made several gains, one notable one by a surprise night attack. Their bridging operations at Gradisca and Tolmino have made little headway. Minor activities are reported all along the line; the siege of Malborgeth continues; the close of the month saw a vigorous resumption of Italian efforts to take Gorizia, which is the pivotal point on the path of progress toward Trieste.

Little significance attaches to the reports

from the Tyrol-Trentino front, which are largely concerned with artillery duels, outpost actions, and skirmishing. Nor have the reports of naval warfare disclosed any important engagements. The bombardment of the Italian coast near Molfetta by an Austrian squadron, the sinking of two Austrian submarines, the unsuccessful attack by an Austrian fleet of twenty warships against the Italian garrison of Pelagosa on the Dalmatian coast,—these are the most notable occurrences of the month on the sea.

Sept.

September, despite severe fighting in this sector, has brought no notable success either to Austrians or Italians. In general the Italian attacks continue, but make no real progress whatever. It is increasingly evident that the Austrian lines are admirably selected and strengthened, and that it is much easier for the Italian to take a trench than to hold it.

The attack launched with such a dash against the mountain passes leading toward Trent has made little progress beyond the mountain ranges of the Tyrolean frontier. Early in the month the despatches announced the capture of Rovereto, an important town thirteen miles south of Trent. After this they were silent until late in the month, when came reports of further engagements east of Rovereto, in which the Italians held their own against the Austrians' inflammable shells. On the other hand, news of Austrian patrols operating as far south as Brescia indicate that the region west of Lake Garda is but thinly occupied by Italian forces. This would seem to offer a route of invasion for a quick, bold attack from the Austrians, who are not unlikely to resume the offensive.

On the Isonzo front progress is no more rapid. The strong Austrian key position at Goritzia remains unshaken. Italian artillery has been heavily engaged against the bridgehead at Tolmino, but the costly infantry attacks have not been renewed. Toward the close of the month, the fighting increased in intensity. Spirited bombardment with inflammable shells, well-handled charges, the failure of which was not due to lack of bravery,—these became common.

Meanwhile the aerial fleets of both sides had been active. The Austrian aeroplanes for the fifth time bombarded Venice with indifferent success; while Italian machines raided hostile bases, and brought in valuable information, such as the news of the strengthening of defenses in the lower Isonzo zone, and the arrival of Austrian reinforcements at this point.

Oct.

In the midst of such momentous events elsewhere, Italian battlefields have attracted little attention. No new offensive movements have been undertaken, and no signal success scored. In the latest official reports, however, (Oct. 24) the Italians claim substantial gains,—the capture of 2000 prisoners in the Carso region, the taking of Presgasina and Monte Nordic west of Lake Garda, and general progress along the Isonzo, including the capture of Trincerone, in the Monte Nero zone.

In the opinion of the Italian General Staff, Italy has accomplished its primary purpose of penetrating Austrian territory and securing strategic points to guard against Austrian invasion. The war is now adjudged to be entering its second phase.

The Italians report their own losses at 45,000, and estimate the Austrian total losses to be upward of 100,000, including 25,000 captured.

Nov.

"In mountain fighting," states Napoleon, "the art . . . consists in dislodging the enemy by enveloping and wearing-down movements." The disadvantage in such operations is with the attacking force. With the full realization of this truth, comes a better appreciation of Italian accomplishments during six months of war. To have captured the dominating positions that bar the way to invasion of Italy and open the routes into Austria, to have drawn away from the Teutonic allies a substantial number of fighting men—if these be the entire aim of General Cadorna's strategy in this first period of the war, his objective has been realized. (The Italians estimate their opponents at 800,000 men).

The military operations may be divided into three sectors:

In the Tyrol-Trentino sector, the month has witnessed some progress toward the Austrian key position of Riva, on Lake Garda, and Rovereto, on the Adige. The former town has been heavily bombarded, and some of its approaches seized. By occupying the valley of the Ledro River, the Italians have blocked a route of invasion into Italy. To the north, in the region of the Tonale and Stelvio Passes, the exploits of their Alpini in this snow-covered, precipitous country have been hailed as remarkable.

In the section of the Carnic Alps, all the dominating heights are now occupied by the Italians, who have fortified these positions. At the eastern end of this range, some advances have been made against the defensive system of Malborghetto, an important town on the road to Tarvis.

It is the Isonzo sector, however, which has attracted the most interest. The Italian attacks, which have been vigorous all along the 50-mile front from Caporetto to the sea, have raged with particular fury about Gorizia. Austrian trenches have been taken and retaken in assaults which reached the hand-to-hand stage. The city has been repeatedly bombarded, many citizens killed, and 300 buildings badly damaged. The Italian lines have been drawn closer about the town and its dominating heights—Monte San Michele, Oslavia, and Podgora Heights. Nowhere, however, have the defenders' formidable lines been broken; the oft-attacked bridge-head, the very center of this "hell of battlefields," remains untaken; and the great fortified camp, hard pressed as it is, may yet resist the long-expected fall. The Austrians report all their main defensive positions intact, and claim to have inflicted a loss on their opponents during the second half of October of 150,000 men.

Doberdo and Tolmino have been the target

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for other Italian drives, only less vigorous than the efforts directed against Gorizia. Air operations have played a prominent part in these campaigns, the Italians being now equipped with a new powerful type of battleplane. Air raids are numerous and increasingly destructive of property.

NOTES ON OPERATIONS IN THE SOUTHERN THEATER

[Italy's Participation in the War. Anonymous. *Sphere*, May 29, '15. 250 words.]

The configuration of the frontier places Italy at a stategic disadvantage. The total length from Switzerland to the Adriatic is about 350 miles. Of this distance, more than one-half encloses Trentino, which juts like a bastion into northern Italy. The whole frontier to within 40 miles of the Adriatic runs through mountainous country. Austria holds the crests of the mountains and the heads of all the more important valleys leading into Italy. Under cover of the Trentino, Austria can assemble a force which will threaten the flank of an Italian force operating east of Verona.

[Italy Declares War. *Independent*, May 31, '15. 2400 words. Map. Portrait of the King.]

In its controversy with Austria, Italy demanded:

1—Cession of Austrian Tirol as far as the Brenner Pass.

2—Cession of Gradisca and Görz.

3—Trieste to be an independent State.

4—Cession of islands on east shore of Adriatic.

5—Renunciation of Austrian interests in Albania and recognition of Italian sovereignity in Avlona.

Austria was willing to cede so much of Austrian Tirol as was inhabited by Italians, to cede Gradisca, to make Trieste a free imperial city, administered by Italian residents and with an Italian university. No. 4 was refused. No. 5 conceded in full. It would appear that the differences between the Italian demands and the Austrian concessions are not sufficiently great to account for Italy's going to war. Indeed the reason assigned for Italy's course is that Austria's declaration of war on Serbia was a violation of the Triple Alliance; consequently, Italy retained full liberty of action, partly because the Austrian price for Italian neutrality was too small, and because Italy's situation had become intolerable. The real reasons are political and psychological—the Italian expansionists are ambitious to take part in the partition of Turkey, and to acquire possessions in Asia Minor. The radical and republican elements have always hated Austria; and no doubt their influence has been strengthened by the brutalities of the Austrians and Germans. The effect of Italy's entrance will be to cut off all traffic hitherto crossing the northern boundary of the peninsula. In a military point of view, Italy will put in the field about 1,500,000 men, with a reserve of as many more. Her fleet is superior to the Austrian. The Austrians have the advantage of position in the Trentino; the left of the Italian advance against Trieste is exposed to attack from the mountains on the north.

[The Defences of the Austro-Italian Frontier. *Información Militar del Extranjero*, June, '15. 2000 words.]

Modern Italy, like ancient Rome, has encountered difficulties in carrying her frontier up to the mountain barrier that lies to the north of her territory.

Rome succeeded in extending her dominion over the continents before becoming the ruler of her own soil. It was not until the time of Augustus that northern Italy secured tranquillity and immunity from the incursions of the northern tribes.

The events of 1866 gave Venice to Italy but left Austria in possession of the crests of the Alps and the sources of the principal rivers.

Nature has divided the Italian frontier into two distinct parts—the first, very mountainous, from Switzerland to the defiles of Carinthia; and the second, less elevated, across the plain to the Gulf of Trieste. The first sector includes Trentino and southern Tyrol, in wedge shape, and commands the two principal railroad routes. In the western part of Trentino there are only three good highways crossing the frontier; and these are easily defended, especially in view of two immense glaciers which block the passage. In the eastern section of Trentino the terrain is more practicable, the passes are lower and more frequent; and the communications lead to the heart of the Tyrol. Further to the east large bodies of troops can be maneuvered easily.

The Austrian defenses have of course, been constructed according to the terrain; heavy works having been placed to cover the lower passes, while the naturally more difficult ones required less preparation. All the forts are heavily armored and provided with auxiliary defenses, such as searchlights, wire entanglements, mines, and other obstacles.

The defenses of Riva constitute an independent group, preventing easy access to the Tyrol from Lake Garda; and the city of Trent is strongly protected.

Further to the north the Franzensfeste group of forts defend the upper Adige from approach through the valleys of the Pustertal and the Brenner.

The Carnic Alps are not fortified; and works are placed only in the pass of the Trave to defend the approach to the Drave, and to support the right flank of an Austrian concentration on the Isonzo; and further to the east are the forts of Hensel and Chiusa, to protect the highway and railway leading to Pontebba, while to the south the old forts of Predil and Flitsch have been remodeled to protect the line of the Isonzo.

Italian Defenses.

Up to a short time ago the defensive preparations of Italy have been concentrated on

her northwestern Austrian frontier, but within the last ten years increasing attention has been paid to the northeastern part of the line.

The highway crossing the Alps by the pass of Stelvio is closed by the fort at Bormio, and the Tonale pass is guarded by the works at Anfo.

The important intrenched camp at Verona is the principal fortress in this theater, and, with Mantua, Peschiera, and Legnago, forms the famous quadrilateral of the lower Adige. To the northeast of Verona the Italians have the group of defenses of the Astico, and in upper Brenta another important group. The Piave is also strongly held, and in this latter sector the forts have been greatly strengthened.

Further to the east the defenses of the Travis Pass have been developed, covering the railroad from Ossapo to Pontebba.

The field army operates to cover these forts, and the intention of the Italian authorities has been to concentrate the forces behind the Brenta, with the flanks resting on Verona and Venice; and on an advance to northeast to rest the left successively on the works in the upper valleys of the rivers.

[Italian Preparedness. *Scientific American,* July 10, '15. 200 words.]

Probably none of the warring nations entered the conflict with better defined plans and clearer purposes than Italy.

She has consistently used her heavy artillery to force the mountain passes, and her statesmen have constantly had in view the redemption of her lost territory.

THE SOUTHEASTERN THEATER

The Dardanelles

Mar

The Gallipoli Peninsula is some forty miles long, nowhere above fifteen miles wide, and at the point where the Turkish forts are erected on the shores of the strait, barely five. In March the fleet had reduced the forts at the entrance to the straits, and had bombarded the forts fifteen miles to the northeast. Being unable to reduce these forts without the cooperation of the army, operations were temporarily suspended.

April

The general attack was resumed on April 25, by combined land and sea operations. The heterogeneous British-French army brought from Egypt consisted mainly of colonial troops, and was commanded at first by General d'Amade, who was later succeeded by General Ian Hamilton.

The first step was the landing of troops at the two points just abreast the entrance of the Straits, the British at Sed-ul-Bahr on the European side, the French at Kum Kale on the Asiatic shore.

A British official report, describing operations of landing on the Peninsula, said, in part: "At daybreak of April 25 the landing occurred, the troops making use of six landing places. By nightfall 29,000 men had been disembarked in the face of a fierce opposition by infantry and artillery intrenched behind successive lines of wire entanglements. Wire entanglements under the sea, as well as on land and deep pits with spikes at the bottom were among the obstacles overcome by the troops. During the afternoon of April 25 strong counter attacks by the enemy began and hard fighting took place. Meanwhile the disembarkation of the army proceeded and was continually favored by good weather. At daybreak on the 26th the enemy was still holding the village and position of Sed-ul-Bahr, which was a labyrinth of caves, ruins, trenches, pits, and entanglements. Aided by the gunfire of the fleet this position was stormed by the British in frontal attack through undamaged wire entanglements. Sed-ul-Bahr was taken about two o'clock in the afternoon, four pom-poms being captured. The situation at this end of the peninsula was definitely secured and the disembarkation of French and British forces proceeded.

"By the evening of April 27th the 29th Division was firmly established across the Gallipoli Peninsula, having advanced two miles from the point of landing. They were joined by French troops, who, having fulfilled the task of silencing the hostile batteries on the Asiatic coast which interfered with the landing on the Gallipoli Peninsula, had recrossed the straits. The Australian and New Zealand corps defeated every counter attack and steadily gained ground."

The report further says: "The casualties in the army necessarily have been heavy. The casualties in the fleet were not numerous. They appear to have been confined to torpedo-boat destroyers and to boats' crews engaged in landing operations. On April 28 and 29 the allied forces rested and improved and consolidated their positions and continued the disembarkation of stores and artillery. All counter attacks by the enemy, which were incessant on April 28, but weaker on the 29th, were repulsed. The fleet, as well as the supporting army, has begun to engage the batteries. The Triumph bombarded Maidos, which was in flames April 29."

May

Since the successful landing of the Allies, official statements in regard to their progress have been meager and unsatisfactory. Turkish bulletins have claimed that the situation was favorable to them, and that the Allies were not advancing. On the other hand, British reports insisted that their army was making substantial, if slow, progress. In the third week in May they had not been able to gain the hills which form the back-bone of the peninsula.

"Press despatches on May 20 from Mytilene confirmed the destruction of the forts at Kilid Behr, on the Dardanelles. The bombardment of the Nagara forts continued, it was reported, day and night. According to a report at Tenedos the town of Maidos had been occupied after a violent action. British aeroplanes, flying over the town of Gallipoli, dropped bombs which started a fire. French troops, it was reported, had been landed at Sed-ul-Behr, and were fighting around the Turkish

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positions at Krithia. The French troops, it was stated, were being supported by the French fleet stationed in the bay. The British forces which debarked at Gaba Tepe were directing their action toward Krithia with the object of surrounding the Turks. The attack on the fortified positions at Chibaba continued."

According to a Turkish report May 24, via Berlin and London, the number of British and French troops landed along the Dardanelles has been increased to 90,000, about 4,000 being incapacitated by illness. The original landing force was estimated at 60,000.

While the Allied army thus made considerable progress during the month, the Turks exacted a heavy penalty by sinking the British battleships *Goliath*, *Triumph*, and *Majestic*. The *Goliath*, sunk by a Turkish torpedo early in the month, was a vessel of 13,000 tons, and carried four 12-inch and six 6-inch guns. The *Triumph* and the *Majestic* were both sunk by submarines, which were probably commanded by German officers. "It is possible that German submarines shipped in sections to Pola, Austria, and there assembled, may now be aiding the Turks. Their presence may seriously affect the future operations of the Allies, as warships offshore engaged in bombarding operations are very vulnerable to submarine attack. The attack upon the *Triumph* was made under cover of darkness from a distance of 300 yards. She was struck amidship, listed and sank in nine minutes. The submarine which fired the torpedo was chased by the destroyers and patrolling craft until dark, but it returned in safety to its base. The *Triumph* was a ship of 12,000 tons, built in 1902, with a speed of 20 knots, and an armament of four 10-inch and fourteen 7.5-inch guns. She led the attack on the German fortress at Tsing-tao and has been active at the Dardanelles since the commencement of the operations. The *Majestic* has been frequently mentioned in action. Completed in 1895, she was 390 feet long and of 15,000 tons displacement. Her battery comprised four 12-inch guns in turrets and twelve 6-inch guns in broadside. She was able to make 17.5 knots at full power.

"The *Majestic* is the fifth British battleship to be lost in the bombardment of the Turkish forts at the Dardanelles, the previous losses being the *Ocean* and *Irresistible*. The French have lost one battleship, the *Bouvet*, which makes a total of six first class warships since the attempt to clear the way to Constantinople was begun, in addition to some smaller vessels."

As a slight offset to these losses, the Turks for their part lost several gunboats and transports, as a result of the activity of the British submarines *AE-2*, *E-11*, and *E-14*. A report on the operations of the latter says that on her passage into the Sea of Marmora the *E-14* sank a Turkish gunboat of the *Berk-I-Satvet* class. In the Sea of Marmora she sank a transport on April 29, a gunboat on May 3 and a large transport, full of troops, on May 10.

The reports from the Gallipoli Peninsula continue to be somewhat fragmentary and unsatisfactory. They record a series of determined attacks and counter-attacks on entrenched positions, with slight gains by the Allies all along the line,—gains which have not been made without heavy cost. An official British report, describing the operations during the last part of May, says:

"Heavy fighting has taken place during this time. To-day our progress is somewhat slower than it was in the beginning, but every inch of ground gained has been organized in such a manner as to permit of the repelling of counter-attacks, and each advance has been held. The physical aspects of the country make fighting extremely difficult and dangerous, as the battle front presents the form of a triangle."

A successful combined land and sea operation against the Turkish position near Rusna is reported on May 31-June 1. The report describes a turning movement, with excellent artillery support, and the resultant rout of the Turks and their pursuit to a point 33 miles north of Kurna.

Night attacks have been of frequent occurrence, in which the Allies have made good use of powerful search-lights landed from their fleet. The details of a one night surprise attack on a Turkish fort by volunteers recalls the assault of Stony Point by Wayne during our Revolution.

The Turkish forces defending the Dardenelles are estimated by the Athens correspondent of the *London Times* at no less than 275,000 men. The number of German officers and non-commissioned officers with the Turks is placed at 12,000. All the guns on the Peninsula, it is said, are manned exclusively by Germans. Certain it is that many of the gallant Turkish counter-attacks —said in some cases to have been made in close formation—are headed by German officers.

On June 4 and 5 a general attack, preceded by an effective bombardment from artillery and fleet, was made on the Turkish lines across the southern end of the Peninsula. Indian, Territorial, Navy, and French divisions all took part in this assault, which resulted in the capture of 2 lines of trenches—in some cases at the point of the bayonet—and an advance of about 500 yards. Four hundred prisoners were captured. Gen. Ian Hamilton praised the work of the Allied troops. One sector of the Turkish position held out against every assault; and, assisted by an enfilading fire from this trench, and by the use of heavy bombs, the Turks made a determined counter-attack on the morning of the 5th that resulted in the recapture of some of the trenches lost during the night of the 4th.

Another attack by British troops on the 11th and 12th succeeded in capturing and holding some Turkish trenches; and on the 23rd Paris reported a further advance over two-thirds of the front and the gain of two lines of trenches, successfully held against

counter-attack. This gain included the head of the ravine of Kerever Dere, so obstinately defended by the Turks.

British submarines have achieved successes during the month in sinking several Turkish transports, loaded with troops, near Constantinople, in Panderma Bay, and near Nagara. It is stated that for this reason Turkish troops are now being sent by rail to the Peninsula.

The reports of an Associated Press correspondent whom the Turco-German authorities have conducted through the lines claim a discouraging situation for the Allies. He states that the latter are in precarious possession of 10 square miles of the tip of the Peninsula, while near Gala Tepe they have lost from 10,000 to 15,000 men, and are scarcely holding their own. The Greek military authorities urge an attack on Turkey by way of Bulgaria—if Bulgaria can be got to join. The arrival of Allied reinforcements at Sedd-ul-Behr is reported, and English feeling is represented by Mr. Asquith's statement on June 16: "The operations are of the highest importance, and they will be pushed to a successful conclusion."

The end of June was marked by an advance by the Allies. General Hamilton, after describing his plan, states that much more than was hoped for was accomplished. The French bulletin says:

"On June 27 the British left, supported by our artillery, won a great success. After an intense bombardment the British captured by assault four Turkish lines at certain points and advanced nearly 1500 meters. They also occupied on the extreme left an eminence on the heights of Krithia and made 180 prisoners. A counter-attack by the enemy last night was crushed, the enemy's losses being very considerable." The Turkish communication, however, claims that these same attacks were all repulsed with heavy loss.

The next few days witnessed some furious counter-attacks by the Turks on the British lines. General Hamilton asserts that all the attacks were repelled with great loss to the Turks. Batteries of field artillery ashore, small arm fire, and bayonet charges by the British forces, it is said, caused great execution, and the ground in front of the British trenches was covered with Turkish dead and wounded. The Turkish casualties from June 28 to July 2 are claimed to be 20,000.

July

The month has seen little change on the Gallipoli Peninsula. Here Sir Ian Hamilton's heterogenous force still faces its herculean task of forcing the gateway to Constantinople, and takes courage from small gains to hope for bigger things. The British losses alone in this expedition (military and naval) up to the middle of July, were over 42,000 men. General Hamilton, in his complete report of the landing operations at the end of April, pays a tribute to the splendid feat of arms of the British soldiers; but the London newspapers criticize the strategy of the movement, and the *Times* calls the whole operation a piece of "unforgivable bungling."

The reports about the operations during July 12, 13, and 14 are equally conflicting. The English report the capture of two strong Turkish lines after a fierce battle, and an advance of 400 yards. During the night the Turks made a counter-attack, and, using bombs, regained the lost trenches. But after heavy fighting all the following day, the French succeeded in carrying once more the Turkish position. The warships, it is said, co-operated efficaciously, shelling Achi Baba and the Asiatic coast.

Turkish reports dealing with the same operations state that all the attacks were repulsed.

Very little was accomplished by either side for the following two weeks. The Allies contented themselves with consolidating the ground gained, and making slight further attacks. A Turkish report of July 21 states:

"The Turkish artillery continues to be active. New batteries have been brought up on the Asiatic shore and in the rear of Sedd-ul-Bahr, and since July 6 have caused heavy losses in men and material to the Allies, whose camps and bases are now constantly under fire. Seven ammunition depots of the Allies were exploded during the period from July 6 to July 10. This was due principally to the fire of Turkish batteries on the Asiatic shore. Against these batteries the artillery of the Allies is powerless and an attack on them from the sea is prevented by German submarines."

The British press representatives with the Allies in the Dardanelles, writing July 7 telling of operations, the modes of attack by the Turks and praising their bravery, says: "The allied men all pay tribute to the extreme gallantry and indifference to death shown by the Turkish infantry, but their methods of attack are crude and wasteful. They are lacking in the knowledge of how to carry out an assault scientifically. The Turks generally mass for an attack behind some natural barrier. Generally our artillery is informed of their massing before the attack is launched, whereupon, knowing all the ranges to a foot, we break up the mass with a torrent of shell. The Turks recently have been adding extensively to the defensive possibilities of their positions in an effort to prevent any further advance by our troops, and the Turkish soldiers have received special orders forbidding their retirement in any circumstances. Their officers have been directed to shoot soldiers who attempt to retire."

The British and French line from the Aegean to the Dardanelles is confronted by rising ground that culminates in the center with the flat summit of Achi Baba, 800 feet high. On either side the ground falls away to the sea in ravines and dry watercourses (*deres*), which the Turks have had time to fully fortify, so that the Allies have had to storm an immensely strong fortress, the advanced works of which they now hold, and the glacis of which has to be crossed before they can move forward to the assault upon the bastion of Achi Baba and beyond to the

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final assault upon the Kilid Bahr Plateau. The Turks are fighting with gallantry—with desperation, indeed, because they realize that when the bastion of Achi Baba falls the occupation of the Kilid Bahr Plateau becomes a mere question of time, and that when Kilid Bahr falls the door is open to an advance on Constantinople.

The French Minister of Marine on July 5 announced that the steamship *Carthage* had been torpedoed and sunk by a German submarine on July 4 off Cape Helles, at the end of the Gallipoli Peninsula. Sixty-six members of the crew were saved.

Aug.

The little corner of the Gallipoli Peninsula to which the Allied expeditionary force is clinging is the center of augmented interest, not only because of the immediate objective of the campaign, but on account of other far-reaching considerations. If Constantinople falls to the Allies, a gateway is secured through which Russia can receive her sorely needed munitions; the Turk will be banished for good and all from Europe; and an effective blow will be dealt to German aspirations for an empire reaching from Berlin southeast to Bagdad. Thus it is not surprising that fresh troops have been landed on the Peninsula from England, that Italy is confidently expected to have joined in this same objective, that the Balkan states are being urged more strongly than ever to throw their strength also against Turkey.

The first part of the month saw practically no change in the opposing lines. Allied supporters were encouraged by the reports that the Turks had but one month's supply of ammunition. This report gains some credence from the reported expedients adopted to transport ammunition across Bulgarian soil,—which have included ammunition trains of cars with false bottoms, and even Zeppelins traveling at night. Attacks by the English and French on Aug. 2 and 10 resulted in the capture and holding of Turkish trenches. On Aug. 9 was reported the sinking of the Turkish battleship *Barbarossa* by a British submarine in the Sea of Marmora. This vessel of some 10,000 tons and with a battery of six 11-inch guns, was one of the principal units of the Turkish fleet. The loss of a Turkish gunboat and an Allied submarine have also been reported.

Beginning Aug 6, a new landing place for British troops began to be utilized, on the shores of Suvla Bay, about 20 miles north of the original landing point at the tip of the Peninsula. This force has been gradually strengthened, has fortified itself, and affords a foothold from which the Turkish line of communication may eventually be threatened.

The British War Office on Aug 26 issued a very frank statement, admitting that the object of the campaign had not been attained, and would call for immeasurably greater losses.

"The great power of defensive under modern conditions," says the statement, "accounts for the difficulties of troops once the advantage of surprise is lost. In the close fighting, with the varied fortunes of repeated attacks and counter-attacks attending these battles, the losses inflicted upon the enemy undoubtedly were much heavier even than our own. The ground gained and held is of great value, but these facts must not lead the public to suppose that the true objects have been gained, or that further serious and costly efforts will not be required before a decisive victory is won."

The operations in progress since Aug 6 on the western extremity of the Gallipoli Peninsula, the statement says, comprise two separate lines of attack—first, from the old "Anzac" position, which was delivered principally by Australian and New Zealand troops; second, from the new landing at Suvla Bay, in which the fresh army was employed. An attack also was made in conjunction with these from Cape Helles toward Krithia. Continuous fighting with heavy losses on both sides resulted. The attack from Anzac, after a series of desperate actions, was carried to the summit of the Sari Bahr and Chanak Bahr ridges, the dominating positions in this area, but owing to the fact that the attack from Suvla Bay did not make the progress counted upon the troops from the Anzac zone were not able to maintain their position and, after repeated counter-attacks, were forced to withdraw to positions close by. These positions have been consolidated effectively.

A fresh advance from Suvla Bay, of about three-quarters of a mile, was reported on Aug 21. Altogether, the British forces are now occupying a twelve mile front. Allied aviators continue to be active.

The Turkish Minister of War gives out optimistic interviews, and points out that the Turks still possess a decided numerical superiority. The destination of the Italian troopships that sailed on Aug 23 under sealed orders is awaited with intense interest. It seems probable that their landing-point may be the port of Eros, on the Gulf of Saros, from which base they could operate against the narrow neck of the Peninsula behind the Turkish positions which the English are facing.

Sept.

To explain the lull in the Allied operations on the Gallipoli peninsula, one recalls the expected reinforcements which have been deemed so essential there. Only at the close of the month came reports,, unofficial ones, of the landing of 110,000 men for the Allies on Lemnos Island. The destination of the Italian troop ships which sailed weeks ago is still undisclosed, and the great drive against Constantinople still hangs fire.

Meanwhile, the fighting continues to be severe and the losses heavy. British casualties up to Aug. 21 total 87,630. Lord Kitchener, in a statement issued Sept. 15, speaks of the enormous difficulties which have attended the operations in the Dardanelles and the fine temper with which our troops have met them. There is now abundant evidence of a process of demoralization having set in among the Turks, due, no doubt, to their extremely heavy losses and to the progressive failure of their resources. The British now hold a front of

more than twelve miles. They have made substantial gains, though they have not succeeded in dislodging the Turks from the crest of the hills.

General Hamilton again emphasizes the difficulties of the Allied forces. "The efforts and expedients," he says, whereby the great army had its wants supplied in a wilderness have, I believe, been breaking world records. The country is broken, mountainous, arid, void of supplies. The water found in the areas occupied by our forces is inadequate to their needs. The only practicable beaches are small breaks in lines of cliffs. With the wind in certain quarters no landing is possible. Over every beach plays fitfully throughout each day devasting shell fire at medium ranges."

Unofficial advices from newspaper correspondents at Athens are to the effect that a big move in force by the Allies is pending and that large bodies of Franco-British troops are disembarking on the Gallipoli Peninsula. Steady progress by the Allies is reported to be causing consternation in Constantinople. There are also reports that Turkey is short of rifles and war munitions. The Allied fleet is reported to have succeeded in locating Turkish batteries along the Asiatic shore of the Dardanelles from a captive balloon, and the Ottoman artillery was silenced by shells from British and French guns, with the result that the camps of the Allied troop now are more tenable.

To summarize the net total of Allied progress, it is necessary to recognize the three Turkish lines of defense which confront them. First, the Achi Baba position, a ridge which extends squarely across the toe of the peninsula, some four miles from the first landing place, and which, rising to a commanding height of 400 feet, effectively blocks the invaders' progress. Second, the Sari Bahr portion, which fronts the landing place of the Australian contingent near Gaba Tepe, rises to a height of 900 feet, and forms a still more formidable obstacle to Allied progress. Third, the second and stronger Turkish line behind the Sari Bahr defenses, which takes its name from the hill of Pasha Dagh, over 900 feet in height. Only the capture of this last commanding position would open the route to Constantinople. In view of the operations to date, it is evident that the Allied hope of early victory must rest upon the intervention of the Balkan states, or the failure of Turkish ammunition. The task of the Turks, for their part, is to hold on until the Germans can buy or force a way through the Balkans for the much-needed munitions. So far, the Turks have carried out their part with great success, and earned the praise of their enemies for valor and for humanity.

According to a despatch from Athens to the Exchange Telegraph Company, a British submarine, navigating the Dardanelles, the Sea of Marmora and the western entrance to the Bosphorus, has turned north in the Golden Horn and blown up a portion of the famous Galata bridge, spanning the Golden Horn and connecting Galata with Stamboul, the principal sections of Constantinople. To make this trip the submarine was forced to run the danger of 160 miles of mines, land fortifications, naval vessels and enemy forces, and it is considered one of the most daring naval feats of the war.

Oct.

No engagements of importance have been reported during the month on the Gallipoli Peninsula. "The fighting at Suvla Bay," General Hamilton states, "has not been on a scale calling for special reports. Every night there have been patrol actions and bomb attacks, and we have gained an average of a little over 300 yards along the whole center of the four-mile Suvla front." Operations for the most part have been confined to aeroplane activities, artillery bombardments in which the fleet participates, and mining operations. British submarines have been active in the Sea of Marmora and have sunk several Turkish transports.

The *Army and Navy Journal* comments thus:

"For some weeks past the Allies have evidently been merely holding the ground they have won and have been unable to make a further advance. It is known that they are largely outnumbered by the Turkish forces, who have the strongest possible fortified positions on higher ground, and to advance further under the present conditions would, it is believed, be suicidal. It is largely owing to the aid of artillery fire from the Allied warships, as seems likely, that the British and French are able to hold their present ground.

The detachment of a number of the British ships from the Dardanelles for operations on the Bulgarian coast fronting the Aegean Sea and the need of troops for service in Serbia and Bulgaria may lead to the abandonment of the Dardanelles operations as at present conducted."

The list of British casualties at the Dardanelles up to Oct. 9 totals nearly 97,000 men.

On Oct. 19 it was announced that Gen. Sir Ian Hamilton had been ordered to return to England, and that Sir Charles Monro had been appointed to succeed him.

Nov.

How the Gallipoli campaign will be affected by the developments in the Balkans is not yet evident. Military critics have assumed that the Allies would be unable to pursue these operations further, on account of the need for men elsewhere. Premier Asquith and Mr. Churchill have both discussed the situation in Parliament, and, while admitting the failure of the operations, have justified their inception on the grounds of having kept 200,000 Turks occupied, and of having held out the hope of a decisive victory that would have settled the fate of the Turkish army and saved the whole Balkan situation. While conditions are now entirely changed, it would still be of great importance to the Allies to force the Dardanelles and the Bosphorus, thereby opening a route of supply to Rumania, whose cooperation is so much desired.

The abandonment of the entire Gallipoli campaign has been most seriously considered. General Monro is understood to have favored

EUROPEAN WAR—Continued

this plan, and it has also been asserted that General Joffre has persuaded the English to withdraw the forces from the peninsula for use in Serbia. It was partly in order to form an opinion on the ground in regard to this question that Lord Kitchener made his trip to this theater. His visit, however, was immediately followed by a vigorous and somewhat successful offensive movement by the Anglo-French. Of course, the withdrawal, if it takes place, either wholly or in part, will be accomplished as quietly as possible.

The usual artillery duels have continued during the month, and subterranean warfare is assuming an increasing importance. The French have successfully exploded several "camouflets." A British offensive on Nov. 15, aided by the guns of the fleet, captured 280 yds. of Turkish trenches along the Krithia Nulla. Later in the month, the Turks attempted several successive attacks against the British position; these the latter claim to have repulsed at all points.

During the month, Allied aeroplanes have bombarded the railway between Constantinople and Dedeaghatch, and warships have repeatedly shelled the latter port, and the coast of Bulgaria and Asia Minor.

See also

DARDANELLES, OPERATIONS AT THE (1915)

Arabia

July

A British column operating near Lahaj, in the hinterland of Aden, has been driven back upon the fortified town by a considerable force of Turkish troops with field guns and a large number of Arabs. Aden, commanding the entrance to the Red Sea has been fortified at a cost of millions and is known as the Gibraltar of the East.

Aug.

Attacks by Turks and Arabs against the strongly fortified town of Aden, have been easily repulsed by that garrison. The capture of this important British naval base would help to give the Turks control of the southern approach to the Suez Canal and the waterway to India.

The Balkans

Oct.

For the third time within recent years, the Balkans are a storm-center of warfare. Serbia, which has for months enjoyed comparative quiet, is now beset on front and flank. The Bulgarian decision to enter on Germany's side was precipitated early in the month by Russia's twenty-four hour ultimatum demanding the dismissal of Teutonic officers known to be with the Bulgarian army. Bulgaria rejected the Russian demands, and in turn sent an ultimatum to Serbia regarding Macedonia. A few days later her armies had crossed the Serbian frontier toward Nish, striking in conjunction with the Austro-German forces which had already begun their audacious invasion from the north. Meanwhile French and English troops were being debarked at Saloniki and were hastening up along the Saloniki-Nish railroad.

The importance of these operations in Serbia, in which such interest has centered, is due largely to the strategic value of this railroad. Extending from Saloniki on the Aegean Sea north through Greece and Serbia some 350 miles to Belgrade, it is practically the only north and south line through this part of the Balkans. Uskub and Nish, two of the most important cities on the route, divide the entire length approximately into thirds. From Nish another line extends through Sofia 400 miles to the south-east to Constantinople. There is no other line from Austria to Constantinople that does not cross Rumanian territory. Hence, in order to relieve Turkey's pressing need for munitions and supplies, it is vital for Germany to secure control of this railroad from Belgrade to Nish. The importance of the southern section of the line lies in the fact that it is practically the only direct route by which the Allies can send supporting troops and supplies to the hard-pressed Serbians. Russian reinforcements must either cross neutral Rumania, or fight their way in from the coast through Bulgaria.

The first week in October saw the Austro-German army, reported to be 300,000 strong, in motion across the Serbian frontier. The main columns crossed the Danube in the vicinity of Belgrade, and at Semendria, 20 miles farther east, while other armies attacked farther west along the Drina and Save Rivers. At the latter points the resistance of the Serbs, strongly posted in the hills, was especially stubborn. Among the commanders of the invading armies was Field Marshal von Mackensen, who led the army east of Belgrade.

At Velika Plana, 25 miles from the Serbian frontier, the railroad forks, its two branches running respectively to Belgrade and to Semendria. The latter route lies along the Morava River, through a country less rugged and hilly than the neighboring territory, and it is up this line that the Austro-Germans have made the most progress, having taken some fortifications and reached a point 15 miles south of Semendria by the third week in October. Belgrade was captured after a heavy bombardment and a stubborn resistance, with fighting in the streets and from fortified buildings. With it were captured a number of large British naval guns. From Belgrade, the invading column followed up the line of the railroad, the Serbians falling back slowly, with obstinate resistance.

Bulgaria's decision to enter the war was evidenced during the second week in October, and her armies promptly crossed the Serbian frontier The first operations were directed toward Nish, on which three columns were evidently converging, through Zaiecar, on a branch railroad running northeast from Nish, through Kniasyevac, farther south on the same road, and through Pirot on the Nish-Sofia line. These attacks in this difficult mountain belt, met strong resistance from the Serbs. Evidently realizing the danger of the arrival of Allied reinforcements from Saloniki, the Bulgarians then developed their main attacks farther south against the railroad, at

Vranya and Vilandovo. The latter point is only five miles from the south-western corner of Bulgaria, and an army of 40,000 men threatened to cut the railway line at this point. Serbo-French troops, however, had been hurried to this point, and, threatening the Bulgarian town of Strumitza in behind these troops, compelled them to fall back. At Vranya, however, some 60 miles south of Nish, the Bulgarians were more successful. Here the country is more open, and the invaders had little difficulty in piercing the attenuated Serbian line, and in seizing the all-important railroad. Late in the month the Bulgarians also occupied Uskub, the junction-point of a branch railroad that runs northwest into western Serbia.

The situation is very complex, and very critical for Serbia. Unless Allied reinforcements can be promptly pushed northwest, her armies will soon be in a precarious position. The Allies have promised speedy assistance,—it must be prompt, indeed, in order to prevent the Teutonic allies from winning the coveted route to Constantinople.

Nov.

A month ago, it was evident that Serbia's only hope lay in the arrival of strong Allied reinforcements. These came not, and the inevitable result followed.

The advance of the Austro-German columns from the north was at first slow, stubbornly contested as it was by the strongly posted Serbs. At the end of October, they had gained, advancing on a hundred-mile front, from twenty-five to forty miles south of Belgrade. Another column about this time crossed the Drina River at Vishegard, and constituted a new army of invasion. It was the Bulgarian activity on Serbia's flank and rear, however, that speedily rendered the position of the defending forces critical. Having seized the Nish-Saloniki railroad at Vranya, the Bulgarians promptly extended this grip on their enemy's line of supplies until they held the important junction city of Uskub, and Veles, 25 miles farther south. In the meantime, their columns directed toward Nish were making progress. Pirot, on the Nish-Sofia line, was stormed by the Bulgars after a four-day battle; another column approached the doomed city from Kniczhevatz on the northeast.

Continuing their advance along the Morava Valley, and greatly assisted by this Bulgarian co-operation, the Germans stormed the Serbian arsenal at Kraguyevac during the second week in November. Once through the difficult mountain country of the north, their progress had become much more rapid. The victors opened the shops of the arsenal, practically the only one in Serbia, and are said to be turning out munitions for their armies. The other Austro-German columns continued their southern advance, reaching the east and west line of the Western Morava, at Krusevac and Krajevo, before the middle of the month.

The fall of Nish was not long delayed, following a heavy bombardment by the Bulgars. A route to Constantinople had already been opened via the Danube, when Germans and Bulgars joined hands near Orsova. Now, however, the coveted direct rail route was in their possession. It will probably be a matter of some weeks still before trains can run over this line, which appears to have been thoroughly demolished by the retreating Serbs. With Nish were captured 100 guns.

Meanwhile, what of the Anglo-French thousands who had landed so bravely at Saloniki, and were to save Serbia? These troops held the railroad from Krivolak south for the remaining fifty miles to the frontier. They gained some successes against the Bulgarians around Strumitza. But they accomplished little else during the month. Veles remained in possession of the Bulgars. With little difficulty the Bulgars worked their way around the French left to the Babuna Pass, 25 miles west of Krivolak, swept aside the small Serbian defending force, and descended through the mountains upon Prilep and Krushevo. The French were scarcely able to maintain their position on the Vardar and Cerna Rivers. The small British force was little in evidence north of Doiran. An Italian supporting army was rumored to be about to land at Avlona. Russia had an army of 350,000 all ready to start "in a week." It was a bitter disappointment for the stricken little nation, and a decisive strategic defeat for the Allies. Superior numbers cannot win battles, unless they are present when and where they are needed.

The remaining strokes in Serbia's defeat followed quickly. Sienitza, Novi Bazar, Mitrovitza (the last the temporary Serb capital) fell in rapid succession before the Austro-German columns. Meanwhile the wedge that the Bulgars had driven westward, with its tip at Uskub, had separated the remnants of the northern and southern Serb armies, and prevented their union. Teutonic and Bulgarian invading forces joined hands at Prishtina, on the railroad branch south of Mitrovitza, which surrendered with 10,000 men. On the last day of the month, the two remaining cities of importance, Prisrend and Monastir, were lost to Serbia. Sixteen thousand prisoners were taken at Prisrend; the rest of the fugitive northern army was driven either into Montenegro or Albania. Only 3000 Serbian troops were reported in Monastir, who retreated south into Greece after vainly trying to organize a defense. Germany claims the conquest of the country and the successful terminaton of the Balkan campaign. At the same time, her troops are carefully watching the Rumanian frontier for a possible foe.

Mesopotamia

Aug.

In the Euphrates-Tigris river valleys, the British-Indian expedition has ascended the Tigris to Amarah, about 200 miles from Bagdad. This is an important commercial area in which German commerce had been highly developed.

Oct.

"In far off Mesopotamia there has been an important battle between the British and the Turks. The Turks were defeated at Kut-el-Amara and are retreating on Bagdad. The British casualties in this battle are reported to

EUROPEAN WAR—Continued

be under 500. The scene of this battle is ninety miles southeast of Bagdad on a bend in the Tigris, and the British Indian force under General Nixon numbers 11,000 to 12,000 men.

Nov.

General Townshend, commanding the British column ascending the Tigris, gained a victory at Ctesiphon over a Turkish force estimated at four divisions. The report states that the English commander had only one division, but was supported by gun-boats in the river. Later, General Townshend was reported to have withdrawn his force farther down the river, in the face of the arrival of Turkish reinforcements. Apparently Bagdad is not seriously threatened.

The Caucasus

July

Here the fighting continues to be of a desultory nature, with nothing approaching a decisive battle. Each army is composed of about 200,000 men, the Turks based on Erzerum, which is without railroad communications, the Russians on Tiflis and Kars. Two divisions of Turkish troops have been recently sent from the Dardanelles to Erzerum.

Egypt

July

Although there is no fighting along the Egyptian frontier, except for demonstrations and patrol skirmishing, the Turks are busily engaged, under German supervision, in constructing railroads from the Damascus-Mecca line toward the frontier, for use in a subsequent invasion of Egypt, should the result of the Dardanelles campaign be favorable to them. About 50,000 Allied troops are in Egypt, which is the main base for the operations against the Dardanelles.

NOTES ON OPERATIONS IN THE SOUTH-EASTERN THEATER

The Balkans

[A Definite Policy in the Balkans. By Sir Alfred Sharpe, K. C. M. G., C. B. *Nineteenth Century,* Sept., '15. 3000 words.]

Up to the end of July, Rumania, Greece, and Bulgaria were still waiting for some clearer indication than had yet been afforded in respect of the outcome of the war. The Allies attempt on the Dardanelles had caused some uneasiness, but there is little doubt that had the fleet succeeded in entering the Sea of Marmora, Greece and Rumania would have actively joined the Entente Powers. Serbia has succeeded in bringing her army to a state of efficiency. Greek policy, or rather that of Venizelos, has undergone a change: for whereas up to the beginning of 1915, no cession of territory to Bulgaria was considered, later the conclusion was reached that the only way to settle the claims of the State against Greece was to give up Kavalla, Serres, and Drama. Since the signing of the Bukarest treaty, Bulgarian policy has been wholly directed toward the recovery of the territory she lost in her ill-considered war against Serbia and Greece.

The present war has served Bulgaria so that she is at present the deciding element in the Balkans. Her policy has been repeatedly stated to be one of neutrality; she will maintain it until she is certain, by abandoning it, to obtain what she wants. Up to the present friendly to both sides, she has nevertheless permitted the transport through her dominion of Austro-German munitions, and the passage of German officers to Turkey. Russian defeats in Galicia have caused Rumania to hesitate. It will be distinctly to the advantage of the Balkan States that the power of Germany and Austria be broken, and that Turkey in Europe should cease to exist. But for interstate jealousies, Greece, Rumania and Bulgaria would long ago have joined the Entente, and the only thing that prevents this now is Bulgaria's outstanding claims. These could be satisfied under a definite agreement by the Entente Powers to guarantee their fulfillment. This would involve the cession of certain areas, already mentioned, by Greece; and of others by Serbia; the latter long ago declared her willingness to turn over to Bulgaria a great part of what she asks, upon the termination of the war, provided Serbia were allowed as she expects, to expand to the northwest. As regards Rumania, she would have to turn over the Dobrudja territory taken from Bulgaria by the treaty of Bukarest. This transfer it would be difficult to guarantee, but there is no doubt that Bulgaria would obtain a just and seasonable settlement of the question with the support of the powers. Greece and Serbia hold to-day far more territory under the Bukarest treaty than they ever had previous reason to expect, territory that would be Bulgaria's but for her unwise action. Bulgaria is exceedingly frank in the statement of her position: she says in substance that she will join the side that grants her demands. The problem before the Quadruple Entente would therefore seem to be simple; and it must be recollected in Bulgaria's favor that she is asking less than would have been hers after the last Turkish war, and has never since the present conflict broke out, varied her claims against both Serbia and Greece. Serbia should take a broad view of the situation; she ought to realize that present generosity to Bulgaria would greatly strengthen her claims to territory to the northwest and on the shores of the Adriatic. Bulgaria's entrance into the war on the side of the Allies would spell the speedy fall of Constantinople, and shortening of the conflict.

The Allies' diplomatic action in the Balkans has been weak; without definite policy, a year's spasmodic and disconnected negotiations have had no material result.

[Fighting for Copper and Cotton. Editorial. *Independent,* Nov. 8, '15. 500 words.]

It is necessary to follow the German campaigns on maps showing railroads and natural resources to understand their aims and achievements. The Germans would rather capture a factory than a fortress, a coal mine or an oil well than a royal castle.

Viewed in this light, the movement on Nish takes on a new significance. Germany is short of copper and cotton. Gen. v. Gallwitz has moved from Semendria 20 miles to Pasharevets. At Pasharevets are rich copper mines. The Germans have opened a way, though not yet a railroad, into Bulgaria across the northeastern corner of Serbia, thus opening a route to Turkey. Turkey, at the beginning of the war, was producing 200,000 bales of cotton a year.

The Caucasus

[The War in Europe. Note. *Army & Navy Jour.*, Nov. 6, '15. 75 words.]

The Grand Duke Nicholas has no light task in the Caucasus. The Turks have 200 battalions there, doubtless below strength and deficient in artillery.

Mesopotamia

[The Capture of the Garden of Eden. Anon. *Sphere*, May 15, '15. 1400 words. Illus. 2 sketch maps.]

After Turkey declared war, it was a matter of great importance to seize the head of the Persian Gulf, principally to protect the Anglo-Persian Co.'s oilfields near Ahwaz.

The expeditionary force, commanded by Lt-Gen Sir Arthur Barrett, consisted apparently of three Indo-British infantry brigades with auxiliary arms in proportion and numbered 15,000 to 18,000 men. The force landed at the head of the Persian Gulf and seized Fao on Nov 7, repulsing an attack by a force from Basra two days later. The enemy was encountered and Sakil captured Nov 17 with a loss of 38 killed and 350 wounded. Basra was occupied Nov 22. The Turkish force under Subr Bey retired to Kurnah and intrenched. Mazera, across the river from Kurnah was captured and from that point the attack on Kurnah was organized. When all was ready for the attack, Subr Bey surrendered, thus assuring the possession of the Basra region. It has now been organized against any possible attempt of the Turks to recover it.

FAR EASTERN OPERATIONS

See

Tsingtau, Siege of

NAVAL OPERATIONS

[Current Notes on the War. Editorial. *Artill. Monatshefte*, June, '15. 4500 words.]

German reports give the following sea losses among her enemies:

England: *Ships of the line* (6 out of 56 before the war). *Audacious, Superb, Agamemnon, Triumph, Bulwark, Irresistible, Formidable, Goliath, Ocean, Majestic.* Lost by artillery fire, 3; torpedoed, 3; submarined, 2; mine, 1; internal explosion, 1. Of 17 participating against the Dardanelles, 6 were lost.

Armored Cruisers (7 out of 43 before the war): *Tiger, Warrior, Monmouth, Good Hope, Hogue, Aboukir, Cressy.* Lost by artillery fire 4, submarined 3.

Protected Cruisers (6, or 1-10 the number before the war): *Amphion. Liverpool* (type), *Pathfinder, Hermes, Pegasus, Hawk.* Lost by submarine 3, artillery fire 1, mine 1.

Torpedo Boats, Gun Boats, and Submarines, at least ten each.

Auxiliary Cruisers (6): *Oceanic, Bayano, Vicknor, Clan MacNaughton, Rohilla, Princess Irene.* Total tonnage 50,000. (*Lusitania* not included).

England's total losses in ships of war, 59; total tonnage 350,000.

France. *Ships of the line:* (2 out of 20 before the war): *Bouvet, Gaulois;* both by artillery fire. *Armored Cruisers* (2 out of 19 before the war): *Leon Gambetta, Montcalm.* Loss by submarine 1, stranded 1, *Torpedo boats,* at least six. *Submarines and auxiliary cruisers,* at least two each. *Gun boats,* one.

France's total losses, at least 15 ships of war. Total tonnage 50,000.

Russia. *Ships of the Line: Panteleimon,* submarined. *Armored Cruisers: Pallada,* submarined. *Protected Cruisers: Chemtchug,* sunk by the *Emden.* *Gun boats, destroyers, mine layers:* one each. *Torpedo boats:* nine.

Russia's total losses, 15 ships of war. Total tonnage, 30,000.

Japan. *Armored Cruiser: Asama,* stranded. *Protected cruiser: Takatschio,* torpedoed at Kiao-chau. *Destroyer: Schirotajo,* stranded. Total losses, 3 ships of war. Tonnage, 14,000.

Total losses for Allies, 92 ships of war. Tonnage 460,000.

Losses in the merchant marine up to May 18, 1915: 178 ships, tonnage 513,392, of which 67 or 279,053 tons, by cruisers, and 111 or 234,339 tons, by submarines. Of this number, England lost the most, 154 of 421,175 tons.

[The War: Its Naval Side. Survey of the First Year's Work. *Journal of the Royal United Service Institution,* pp. 190 to 241, Vol. LX, No. 439, Aug., '15. 30,000 words.]

(This article is a continuation of a similar one appearing in the November (1914) issue of the *Journal* and brings the survey up to the end of July, 1915, completing the first year of the war.)

Operations are dealt with chronologically in seven main divisions: North Sea and Baltic, Adriatic, Dardanelles, Atlantic, Pacific, Indian Ocean, and Black Sea.

See also

"Königsberg"-"Severn" engagement
Submarines—Use of in European war

AIR OPERATIONS

[Allied Air Raids into Germany. *Sphere,* Oct. 2, '15. 500 words Illustrated. Map.]

Indicating the extent of the air raids made into Germany, a map is published showing the courses pursued and destinations of seven air raids made between Aug. 9 and Sept. 13. Five of these raids were made in the week Sept. 6-13. As many as 60 aeroplanes participated in one raid on Dillingen. The distances of the points raided inside the German lines varied from 2 to 62 miles, five of them exceeding 43 miles.

EUROPEAN WAR—Continued

OPERATIONS ELSEWHERE

See also

AUSTRALIA—EXPEDITIONARY FORCE FOR EUROPEAN WAR
EUROPEAN WAR—LOSSES—AUSTRALIA
"EMDEM," OPERATIONS OF THE
FALKLAND ISLANDS, NAVAL ENGAGEMENT AT
HELGOLAND, BATTLE OFF
NEW GUINEA—HISTORY

NOTES ON OPERATIONS ELSEWHERE

[Seizure of the German Pacific Possessions. *Australian Military Journal.* January, 1915. 3500 words.]

A description of the combined military and naval operations of Australia which seized all German wireless stations in the Pacific, occupied German territory and instituted suitable arrangements for temporary administration.

—Aeronautics in

See

AERONAUTICS—PROTECTION AGAINST AERONAUTIC ATTACK
AERONAUTICS—USE OF IN EUROPEAN WAR
DIRIGIBLES—USE OF IN EUROPEAN WAR
EUROPEAN WAR—AIR OPERATIONS

—Ammunition

[The Expenditure of Ammunition. *Army & Navy Jour.*, June 12, '15. 500 words.]

In a speech in Parliament Apr 21, Lloyd George stated that the expenditure of ammunition had been greater than any army had anticipated. All had been taken by surprise in this respect, including the Germans.

Calculations had been based upon the theory that there would be occasional great battles separated by intervals of perhaps a month, whereas there had developed continuous fighting extending for weeks and months, with a steady expenditure of ammunition day and night. Due apparently to lack of ammunition, the Germans finally confined their firing to certain hours of the day.

There has also been a change in the character of the ammunition. It had been assumed that shrapnel would be used largely. While shrapnel has been used for some purposes, in the trench fighting, high explosive shell has shown itself to be the kind of ammunition needed. The French realized this at the beginning of October and reorganized their manufacture accordingly. The German shell is not as good as at the beginning of the war, probably due to the enormously extended manufacture and attendant difficulties.

See also

EUROPEAN WAR—MUNITIONS

—Ammunition—Consumption

British military experts now in the United States are quoted as saying that 250,000 shells a day is a fair average consumption by the Allies. (From the *N. Y. Tribune.*)

[Notes on the European War. *Army and Navy Jour.* May 1, 1915.]

On April 21, in a speech in the House of Commons, the Chancellor of the Exchequer stated that there were more than 36 British divisions at the front, approximately 750,000 men. British losses to Apl 11 totalled nearly 140,000. The surprise of the war was the enormous consumption of artillery ammunition. During two weeks including Neuve Chapelle, nearly as much artillery ammunition was expended as during the whole Boer War. The British are now able to manufacture more than 21 times as much munitions of war as in September, but the output is still insufficient. (*Ibid* May 29.)

[Ammunition and Finance in the Present War. Editorial: *Scientific American,* July 19, '15. 1000 words.]

A few months after the opening of the European War, a leading German general stated that the ammunition expenditure had proved double the amount estimated by the staff. Later developments have further increased the requirements so that the expenditure exceeds the estimate two to three times, but the Teutonic Allies show no indication of scarcity of ammunition. They had a large reserve at the beginning of the war and their manufacturing industries are thoroughly organized.

The method of attack on the western front is to mass artillery on the sector to be attacked, destroy the trenches by a deluge of high explosive shell, then shift to shrapnel and rake the ground in rear to prevent troops from coming up. Under cover of this fire the infantry move forward, secure the ground thus won, and dig themselves in. Success is thus bought with an enormous expenditure of ammunition.

But ammunition is very expensive, and the war may thus resolve itself into a question of financial resources.

[Ammunition Deficiency in France and Russia. Contemporaneous Notes on the European War. Editorial. *Artil. Monatshefte,* Mar '15. 5000 words.]

In France there is a great deficiency in heavy artillery ammunition. Some Russian corps have even been supplied with guns and ammunition sent from Japan. Due to the great development of its ammunition industries in time of peace, Germany is said to be well supplied with ammunition. French aeronauts are instructed to direct their attacks against German powder factories.

See also

COTTON—USE OF IN EUROPEAN WAR

—Ammunition—Supply

Canada

[The War in Europe. *Army & Navy Jour,* June 19, '15. Note.]

According to a statement, June 11, by Maj.-Gen. Bertram, chairman of the Canadian Shell Committee, the daily output of shells would soon reach 50,000. 130 factories are engaged in manufacturing shells or shell parts.

Germany

[The Problem of Ammunition Supply. *Armee Zeitung.* (Vienna.) July, '15. 540 words.]

While England, Russia and Italy are hastily organizing their ammunition factories and beginning to recognize the importance of an ammunition supply, we do not hear a word about our own. The problem for us does not exist. We repel every advance on three fronts with no thought of the farsighted and ideally organized preparations in the interior. It is fortunate that this instantaneous outbreak of war found Herr Krobabin at the head of affairs. The full accomplishment of all demands upon the ammunition factories is due to his ability in organization. Germany stands first in the world in the manufacture of ammunition, and it is our duty to our ally to maintain this supremacy.

Great Britain

[Note: *Army & Navy Jour.*, July 10, '15. 250 words.]

Victory is a question of supply of war material, according to a statement of Mr. Lloyd George in the House of Commons. The Central European powers are producing 250,000 shells a day, about their limit. The allied production is not so great, but must be made even greater, and they should soon be receiving ammunition from the U. S. The indications are that the Allies are gathering themselves together for an overwhelming assault on the German armies at a later time, as late a date as next March being mentioned.

[Organizing the Nation,—The Crying Need for Shells. *Weekly Edition London Times,* June 11, '15. 5000 words.]

(Note. Here are reproduced certain speeches by Mr. Lloyd-George, the new Minister of Munitions. These speeches set forth very clearly that an ample supply of munitions is of the utmost importance, and that compulsory service in the factories is a stern necessity. The army of volunteers at the front has placed its services absolutely at the disposal of the Government. He asks the workmen at home to do the same. The urgency of the situation is plainly stated. "You cannot argue under shell fire; you can only decide.")

—Ammunition—Shell preferred to Shrapnel

[The War in Europe. Note: *Army & Navy Jour.*, July 3, '15. 25 words.]

It is reported that shrapnel orders placed in the U. S. have been changed to call for high explosive shell instead.

—Artillery in

See

ARTILLERY—USE OF IN EUROPEAN WAR
FIELD ARTILLERY—USE OF IN EUROPEAN WAR

—Asphyxiating Gases in

See

ASPHYXIATING GASES—USE OF IN EUROPEAN WAR

—Casualties

See

EUROPEAN WAR—LOSSES

—Cavalry in

See

CAVALRY—USE OF IN EUROPEAN WAR

—Condition of Belligerents

[The State of the Belligerents. *Independent,* July 26, '15. 650 words.]

In Germany, a threat of a strike among the Krupp workmen has been averted by concessions. German statistics show in Berlin an increase of about 69 per cent in general cost of food between May 1914 and May 1915. In Vienna, the increase was from 83 to 167 per cent. The German government on July 16 prohibited the use of cotton for cloth making. Reserves up to 45 years of age have been called to the colors. British estimates place the German losses in submarines at 29 to 35 since the war began.

In France, on Bastile Day, July 14, crape was hung on the monument to the city of Lille, as it has been in the past on the Strasburg monument. President Poincaré declared that the war must go on until the future was secured. Gen. Gallieni prohibited the use of alcoholic liquors by the garrison of Paris.

In Great Britain, men formerly rejected for physical disability were accepted as recruits. Lord Lansdowne declared July 13 that not more than 440,000 British troops were at the seat of war. In a demonstration in London, women from all parts of the Empire declared their willingness to assist in all possible ways in the prosecution of the war. The new Munitions Law failed to prevent a strike of 150,000 miners in South Wales. (Since settled—Ed.) British financial conditions remain sound. On July 13 it was announced that the new war loan of $3,000,000,000 had been fully subscribed. Bankers declare that Great Britain can provide $5,000,000,000 a year for several years.

—Cost

[The Daily Cost of the War. *Arms and Explosives.* Jan., '15. 1150 words.]

In peace time, armament cost is almost negligible from the point of view of the individual. Experience now shows that although the energies of the country are wholly bent on the prosecution of the war, no money tightness is yet manifest. It is doubtful if capital is furnishing the sinews of war; on the contrary, it would appear that the war is being conducted out of the margin of consuming power resting on the self-denial of the community. Although goods for export are being turned out in lessened quantities, there is reason to believe that purchases are being merely postponed, and that under this head abundant activity will be displayed later. The immediate net loss is that of profit on capital usually employed in supplying foreign customers; a loss that, however, should be covered by the immense economies of individual expenditure. The loss of life stands on different ground, but even this price may be regarded as cheap in view of the ends to be attained.

EUROPEAN WAR—Continued

The commercial lesson is that the ratio of national earnings paid out to the capital value of the interests of state is negligible.

Great Britain

[Notes of the War. *Army and Navy Jour.*, Sept. 18, '15. 300 words.]

Premier Asquith announced that England's average daily expenditure has reached $21,000,000. A new credit of 1¼ billion dollars brings the total war credit to $6,310,000,000, and will finance the war till the third week in November.

[The Revelations of the Budget. By Archibald Hurd. *Fortnightly Review*, Nov., '15. 8000 words. Tables.]

Great Britain has paid a high rate of naval insurance in the maintenance of her fleet, with the idea that in that way heavy expenditures for an army would be avoided. But the very success of the navy in dominating the sea has involved Great Britain in war expenditures greater than those of any of her allies.

The peace revenue of 1913-1914 was $990,000,000. The estimated war revenue for 1916-1917 will be almost double that amount,—$1,935,000,000. The estimated expenditure for the present fiscal year is $7,950,000,000, of which $1,000,000,000 represents the normal expenditure in peace, leaving $6,950,000,000 as the war expenditure, of which only a small portion was for the navy.

Great Britain had expended wisely. On the eve of war, military and naval expenditures totalled 40% of the entire revenue. The extent of this burden was due in some measure to the principle of voluntary service, and this is the only principle upon which a maritime power can raise a long service Regular Army *for the defense of its oversea colonies.* In time of peace, the army cost $150,000,000, and the fleet over $250,000,000. The distribution was wise. Behind the cover of the fleet, an army could be created. It has been of immeasurable assistance to the Allies, because it has enabled Great Britain to make loans to them which, by next March, will reach the sum of $2,115,000,000.

What is the war really costing Great Britain this (fiscal) year? The gross outlay is $7,950,000,000, but the peace expenditure and the loans to the Allies and certain other small items must be subtracted. When all deductions have been made, the net expenditure is just over $4,500,000,000, of which 1-7 is for the fleet, over 5-7 for the army, and the remainder for miscellaneous war purposes.

To meet these enormous expenditures, a budget has been introduced which greatly increases the scope of the income tax, increases enormously the existing income tax, takes 50% of the war profits of business firms, and extends taxes in other directions, nearly doubling the previous income. Of the total revenue of $990,000,000 only about $100,000,000 will fall upon the poorer classes. All considered, the $10 a week man with a family is bearing his fair share of the burden. For the man with a larger income, there has been a heavy increase. For incomes of $10,000 a year, the tax has been nearly trebled, and is now $1400 a year. The new proposals are heroic, and the nation is making present income go as far as possible toward meeting the war expenditures. The German government, on the other hand, is meeting war expenditures entirely with "paper," and the Imperial Finance Minister has stated that no additional taxation will be imposed, perhaps in the hope or belief that war expenditures may in the end be covered by indemnities exacted from her enemies.

[Notes of the War. *Army & Navy Jour.*, Nov. 13, '15. 100 words.]

Premier Asquith on Nov. 10 asked for a credit of $2,000,000,000. The amount on hand will finance the government until the end of November. The average cost per day up to Sept. 12 was $21,750,000.

Switzerland

[The War in Europe. *Army and Navy Jour.* Oct 9, '15.]

The President of Switzerland announced that the Swiss mobilization had cost to Sept 1, $28,000,000, and is now costing Switzerland about $5,000,000 a month.

—Dirigibles, Use of in

See

DIRIGIBLES—USE OF IN EUROPEAN WAR

—Diseases in

[Epidemic Diseases in the War Zone. *Jour. Amer. Medical Assn.* July 24, '14.]

It is reported that Asiatic cholera and smallpox are raging in Galicia; that 120 cases of cholera were reported from Lemberg on July 13, and 419 cases of smallpox in the province between July 4 and 10. Cholera is said to be increasing among the Austrian troops, especially those which have recently returned from Galicia.

See also

TYPHUS

—Engineering—Field Operations

See also

ENTRENCHMENTS
EUROPEAN WAR—MINING OPERATIONS
RIVER CROSSINGS—IN EUROPEAN WAR

—Field Artillery in

See

FIELD ARTILLERY—USE OF IN EUROPEAN WAR

—Food and Commodity Prices and Supply

Germany

[Food-prices Soar in Germany. *Literary Digest*, Aug. 28, '15. 750 words.]

Quotations from *Vorwärts*, the *Kölnische Zeitung*, and the semi-official Berlin *Lokal Anzeiger* show that there has been a substantial rise in the price of foodstuffs in Germany, amounting to two- and three-fold in some important necessaries, and that a general rise amounting to 50% to 60% has occurred in the family budget due to increased prices of foodstuffs.

[The Food Problem in Germany. *Memorial de Ingenieros,* Madrid, Aug., '15. 1000 words.]

Since the appearance of the war bread, or "K. K. Brot," in Germany, there has been much speculation concerning the amount of food thus furnished.

This bread is also made in England, where the loaves are usually cubical, with little crust. The English bread is white, spongy, and light, absorbs liquids readily, and has good keeping qualities. In both countries it has potato starch as a base.

The German bread is apparently inferior in quality to the English, being compact, heavy, and indigestible.

The French insist that rice bread is better, as it is richer in starch; and, if mixed with 20% of wheat flour, has an agreeable taste and is nutritious. It is well known that Japanese rice bread is highly esteemed in Eastern countries.

It is interesting to note that the lack of food and the scarcity of explosive materials which are currently supposed to exist in Germany and Austria follow from the scarcity of nitrogen in available form. Although it exists in inexhaustible quantities in the air, it is lacking in the form of albuminoids for food and nitrates for explosives. Foreign sources of supply being cut off, agriculture must largely supply the want.

Long before the war Germany commenced investigations to obtain nitrogenous elements to substitute for meat, cheese, vegetables, eggs, etc., and carbohydrate elements to replace fat, sugar, alcohol, etc.; with some good results, especially from forest products, which can be obtained at home. Experiments have been under way, and are still being continued, to form from the cellulose products of wood certain semi-predigested foods. The results of this investigation have not been published.

The "Fermentation Institute" of Berlin is also experimenting with an alcoholic yeast, very rich in albuminoids, which, dried and sterilized, is a good food for both man and beast. The ammoniacal salts obtained from the process furnish illuminating gas, and a good proportion of sugar is obtained.

On the whole, it does not appear that hunger in Germany will bring peace.

[Germany as Nature's Competitor. Editorial. *Scientific American,* Nov. 20, '15. 500 words.]

German claims are heard of an uninflammable gas lighter than hydrogen; of the substitution of alcohol and benzol for petroleum and of paper for jute; of newly discovered formulae for artificial rubber and leather; of microbes that convert sugar into fats; of compressed food at once nourishing and inexpensive; of explosives made from wood pulp; and other feats of chemistry.

The fact that Germany is using every effort to secure from abroad many of the articles for which substitutes are claimed to have been found does not mean that the claims mentioned above are untrue. It merely means that the laboratory methods involved are impracticable on a large scale, or are too expensive.

—Forces engaged

The French government estimated, Mar 1, that Germany had 1,880,000 men on the western front and 2,080,000 on the eastern.

According to an official announcement, Mar 22, the number of prisoners of war then in Germany was 801,000 enlisted men and more than 9000 commissioned officers. During the war of 1870-71 the number of prisoners of war was 383,000.

[Britain's Part in the War. *Sphere,* May 1, '15 500 words. Diags.]

The total length of the line of contact between the belligerents [exclusive of the Austro-Italian front.—Ed.] is 1866 miles. On one side the Germans occupy a front of 1092 miles, the Austrians 574 miles, and the Turks 200 miles. Of the Allies the Russians hold 1057 miles, the French 543 miles, the Serbians and Montenegrins 218 miles, the British 31 miles, and the Belgians 17 miles. The 31 miles held by the British, however, is a front on which especially heavy and critical fighting has occurred. Great Britain's chief contribution to the Allied cause is the dominion she exercises over the sea.

[Why Germany Must Lose. By Frank H. Simonds. *Independent,* Nov. 15, '15. 1800 words.]

(Note.—This is a calculation to show that by Aug. 15, 1916, Germany and Austria will have 2,700,000 troops to maintain front against 5,700,000 Allied troops. Certain data only are abstracted.)

From the official German casualty lists, the German casualties to Aug. 15, 1915, are calculated to be 2,400,000. German casualty lists do not include slightly wounded or those incapacitated by illness. Assuming discharges and deaths from illness to equal the number of wounded returned to duty (=20%), the permanent German loss is 2,400,000 or 200,000 per month. The French official estimate of the German losses is 260,000 per month. The German official estimates of the French losses are 2,000,000, or 50% of the total French force. The Austrian battle loss, based upon the same ratio as the German, would aggregate 1,800,000. The Austrian losses in prisoners are placed at 600,000, making the Austrian total loss 2,400,000. The American Embassy in Petrograd, which looks after Austrian prisoners, knew of nearly 700,000 last spring. The French estimates give the German and Austrian losses about equal, but much higher than the above figures. Assuming the same percentage of casualties in the British force next year as in the German army for the first year (1,000,000 total), there will be 2,000,000 British troops available Aug. 15, 1916. Italy can maintain her force at 1,000,000, as she has plenty of men in proportion to her force. With Russia, it is a question of equipment rather than men. Her prospective losses are placed at the same figure as during the first

EUROPEAN WAR—Continued

year, while Austrian losses in prisoners are eliminated for next year due to German reorganizaton. Upon this basis, the calculation results as stated.

[The Reform of the English Army. *Información Militar del Extranjero,* June, '15. 1500 words.]

In the latter part of April of this year a detailed discussion in the House of Commons of the condition and reform of the army resulted in what was pronounced to be a satisfactory conclusion in regard to recruitment and organization. Exact details have not been published, but the authorities affirm that the progress of building up a sufficient military force is equal to their best expectations. At least 30,000 recruits weekly are being secured and no reinforcements go forward without at least six months preparation.

The sanitary condition of the troops in France is good, and wounded arrive in London within twenty-four hours.

Sufficient aeroplanes are in service and new machines are constantly joining the fighting line.

The supply of munitions is increasing rapidly, and the quantity of artillery projectiles is now ample.

Exclusive of the contingents from the colonies, the total strength of the English army at the end of April numbered about 750,000 men, organized in 36 divisions.

The upper classes in England are taking the war seriously, as evidenced by the increasing numbers of professional men and students enlisting.

[Notes of the War. *Army and Navy Jour.,* Sept. 18, '15. 200 words.]

Lord Kitchener announced Sept. 15 that eleven divisions have been added to the British forces in France and Flanders. This indicates in connection with previous announcements about 700,000 British troops on the western front. The reinforcements enabled the British to take charge of 17 additional miles of front, making the total British front about 50 miles.

[The War in Europe. *Army & Navy Jour.,* Nov. 6, '15. Quoted.]

Premier Asquith, of Great Britain, in Parliament on Nov. 3 gave some interesting facts concerning the army and navy of the empire as they stand to-day. He said that in the last operations described by Field Marshal Sir John French that officer had under his command not far short of a million men. To these must be added the troops at the Dardanelles, in Egypt and in other theaters of war, as well as garrisons and troops in reserve. The contribution of India was splendid. Canada contributed 96,000 officers and men; Australia, 92,000; New Zealand, 25,000; South Africa, after a brilliant campaign subduing the Germans, sent 6500, and Newfoundland, 1600. Ceylon, Fiji and other parts of the empire all sent contingents. No account is taken in these figures of preparation for maintenance of these units in the field. As to the work of the navy in transporting troops, Mr. Asquith said 2,500,000 officers and men had been carried, in addition to 320,000 sick and wounded, 2,500,000 tons of supplies and 800,000 horses and mules. Up to the present the loss of life in the whole of these gigantic overseas operations has been considerably less than one-tenth of one per cent.

[Is England Making Good? By Lord Northcliffe. *Independent,* Nov. 15, '15. 1600 words.]

The raising of the British army offers many parallels to the raising of men in the Civil War. At the end of fifteen months, more than two million recruits have been raised, and the oversea dominions have furnished large contingents. The navy has shown its power, and amid many difficulties these two million recruits have been secured, together with 30,000 men who have been hastily made into officers. This force has given a good account of itself in battle, as the German saying "No one returns from Ypres" shows.

Greater than the recruiting problem has been the problem of equipment. On the trail of an army, one realizes how much the soldier needs. On the one hand is the clothing question—boots, belts, summer and winter clothes, etc. On the other hand, machine guns, trench mortars, field artillery, heavy artillery, bombs, periscopes, even short daggers which are now taking the place of bayonets in some parts of the firing line. War eats up material as quickly as it does men.

We have recruited well, and now even greater efforts are being made. Conscription may ultimately be necessary. Censorship has served to keep the British public in ignorance of events and has concealed the magnitude of the task. The Germans have been stopped on the western front, but are now aiming in the direction of Suez. They will probably go much farther on their way than they are at this writing, but the author is sure that in the end the Anglo-Saxon will win.

—Fortifications, Experience with

See

BELGIUM—FORTIFICATIONS
DARDANELLES, OPERATIONS AT THE (1915)—STRENGTH OF DARDANELLES FORTIFICATIONS
FORTIFICATIONS—FIELD—EXPERIENCE WITH IN EUROPEAN WAR
FORTIFICATIONS—PERMANENT—EXPERIENCE WITH IN EUROPEAN WAR

—Hospitals in

See

HOSPITALS—IN EUROPEAN WAR

—Losses

Figures on the losses of the principal powers engaged in the war, furnished by the Red Cross and compiled and issued June 18 by Dr. K. Ziegler, German Consul in Denver, Colo., state that the total killed in the first six months of fighting was 2,146,000. The complete table follows:

	Germany.	Austria.	France.	Great Britain.	Russia.	Totals.
Dead	482,000	341,000	464,000	116,000	733,000	2,146,000
Slightly wounded	760,000	618,000	718,000	185,000	1,500,000	3,781,000
Seriously wounded	97,000	83,000	439,000	49,000	482,000	1,150,000
Prisoners	233,000	183,000	495,000	83,000	770,000	1,764,000
Totals	1,572,000	1,225,000	2,116,000	433,000	3,485,000	8,831,000

[Notes on the War. *Army & Navy Jour.* Aug 28, '15. 300 words.]

An "authoritative British source" gave out information on Aug 24 relative to the German numbers and losses. On July 31 it is asserted that there were 1,800,000 men on the western front and 1,400,000 on the eastern front, there being also 1,120,000 Austrians on the latter front. It is calculated that the effective loss to the Germans is 1,000,000 in addition to 500,000 absent from the front wounded in hospital, a total net loss of 1,500,000.

[The War in Europe. Note. *Army & Navy Jour.* Aug. 21, '15. 200 words.]

A dispatch from Berne, Aug. 8, to the *London Morning Post* gives the German losses, according to the latest casualty lists, as 2,178,-783. Ottawa reports Aug. 8 gave the Canadian losses to date as 1877 killed, 6738 wounded, and 2065 missing, total 10,680.

[The Cost of the War in Human Life. *Arms and the Man,* Nov. 18, '15. 700 words. Tables.]

In an address delivered at West Point before the New York State Historical Association, General F. V. Greene gave what he called "not much more than intelligent guesses" in respect of certain features of the war. Certain figures, taken from official reports, are more trustworthy. For example, in Europe, the Allies are drawing on a population of 266,-500,000, as compared with 122,200,000 of the Central Empires and their ally Turkey. The world over, the Allies have 739,000,000; the Empires 155,000,000. The Allied armed peace strength is 2,196,000, the Teutonic, 1,360,000; war figures are 7,940,000, and 5,620,000, respectively. At sea the Allied tonnage is 4,780,000, the Teutonic, 1,750,000. Total losses in battle, are "intelligently guessed" to be:

	Killed	Wounded	Missing	Total
Allies	1,036,000	1,846,000	1,285,000	4,167,000
Cent. P'rs.	1,030,000	1,780,000	1,020,000	3,830,000

A similar "guess" in respect of finances leads to the following results expressed in millions of dollars:

	National Wealth	National Debt 1914	1916
Allies	204,500	18,170	30,950
Central Powers	108,000	5,460	12,660

"The fabled stories of the countless hordes who crossed the Hellespont with Xerxes have been far surpassed by the actual numbers of the forces engaged in the present conflict. The figures are certainly startling. In Europe 78 per cent of the population at war, in all the world 56 per cent of the population involved in the conflict; 13,000,000 men actually under arms; 2,000,000 killed, nearly 4,000,000 wounded, more than 2,000,000 prisoners. We cannot grasp these figures, but we can get some idea of what they mean by comparing them with the results of previous wars. We were accustomed to speak of our civil war as the greatest conflict of modern times, but apparently it was only one-tenth the magnitude of the present conflict.

"At no time did the number of men actually under arms, North and South, exceed 1,300,-000, and the total number of those killed in battle and dying of wounds on the Northern side was 110,070, and on the Southern side probably not more than 80,000; so that in four years of war then the destruction of life was less than one-tenth of the destruction of life during a little more than one year at the present time. In the Napoleonic wars, from 1796 to 1815, the largest army ever assembled was that which Napoleon led into Russia in 1812, and this numbered somewhat in excess of 500,000. The German armies fighting to-day in Russia on the east and in France on the west are more than six times as large."

Australia

[Australian Roll of Honor. Casualties Sustained in Operations at the Dardanelles. *Australian Mil. Jour.*, July, '15. 37 pages.]

This is a list, by name, of casualties among Australian troops between April 25 and the date of going to press.

The troops reported on were 3 brigs. of infantry (16 bns.), 3 brigs. of artillery, 3 regs. of cavalry, 3 f. cos. of engineers, 2 signal cos., 4 ambulance cos. and — cos. of the service corps.

Division and brigade staffs lost 4 officers (1 maj. gen.) killed and 4 wounded; infantry, 102 officers and 576 men killed, 191 officers and 4140 men wounded; artillery, 1 officer and 4 men killed, 7 officers and 10 men wounded; cavalry, 1 officer and 3 men killed, 5 officers and 45 men wounded; engineers, 2 officers and 1 man killed, 2 officers and 40 men wounded; signal troops, 10 men wounded; medical troops, 8 men killed, 5 officers and 45 men wounded; service corps, 2 men killed, 2 officers and 12 men wounded.

The full strength of an infantry battalion is about 28 officers and 1000 men. The loss of officers was consequently over 60%, even if all were present, and the loss in men was almost 30%. Also it will be noticed that the number of officers killed was more than half that of those wounded, while among the men the ratio was about 1 to 7. There was a great variance in the ratios of killed to wounded in battalions: One lost 12 officers and 27 men killed, 13 officers and 374 men wounded; one lost 4 officers and 80 men killed, 6 officers and 180 men wounded; one lost 6 officers and 10 men killed, 15 officers and 340 men wounded.

Canada

[The Wastage of Officers. Anonymous. *Canadian Military Gazette,* May 11, '15. 550 words.]

Twelve Canadian infantry battalions participated in the three days' fighting around

EUROPEAN WAR—Continued

Ypres. There were probably 350 to 375 officers with this force, and already over 200 casualties have been reported and more are to follow,—a total of possibly 70%. This heavy loss in officers will necessitate considerable reorganization. The high standard of the enlisted men will make replacement by promotion possible, and the enlisted men so promoted will speedily become good officers. An officers' training school of large proportions is about to be started at Niagara. It is thought that university students can be trained for duty as officers in a short time.

[The War in Europe. Note. *Army & Navy Jour.*, Oct. 30, '15. 100 words.]

Total Canadian casualties to Oct. 16, numbered 667 officers and 14,510 enlisted. Detailed casualties are: Officers, 99 killed, 25 died of wounds, 6 died of illness, 6 prisoners, 32 missing, and 457 wounded; Enlisted, 1625 killed, 654 died of wounds, 172 died of illness, 1251 prisoners, 1110 missing, and 9660 wounded. Accidentally killed, 2 officers and 38 enlisted. About 40% of the wounded have returned to the front.

Germany

[German Casualties. *Weekly Edition London Times,* June 11, '15. 200 words]

518 German Casualty lists have now been issued, the latest dated June 3. The classification is according to regiments, and only a general indication is given as to the period in which the losses occurred. Analysis is difficult, but heavy losses are indicated for certain regiments. Between Apr 29 and May 19 the Kaiser Alexander regiment of the Grenadier Guards lost more than 850 men. Other heavy losses are: Infantry Regiment No 60, 550, Apr 24-May 17; Landwehr Regiment No 74, nearly 600, May 1-18; Infantry Regiment No 132, about 800, May 2-17; Reserve Infantry Regiment No 213, about 750, Apr 21-28 and May 11-13.

The lists show the mixed composition of many regiments. The casualties in many cases include men of the actual army, Ersatz Reserve, Landwehr, Landsturm and volunteers.

[Losses in the German Field Artillery. Contemporaneous Notes on the European War. Editorial. *Artill. Monatshefte,* Mar '15. 5000 words.]

Losses published to Mar 1, 1915, in the German Field and Foot Artillery:

Field Artillery

Dead	515	officers,	6774	men
Wounded ..	1419	"	22505	"
Missing ...	30	"	1462	"
Captured ..	8	"	47	"
Totals	1972	officers,	30788	men

Foot Artillery

Dead	89	officers,	997	men
Wounded ...	155	"	3516	"
Missing	2	"	247	"
Captured ...	2	"	14	"
Totals	246	officers,	4774	men

[Notes of the War. *Army and Navy Jour.* Oct 9, '15.]

Prussian casualties according to lists totalled 62,468 killed, wounded, and missing from Sept 17 to Sept 28. This brings the total of the Prussian casualty lists to 1,916,148.

Great Britain

[Army Losses. *Weekly Edition London Times,* June 11, '15. News item.]

Mr. Asquith announced in the House of Commons that the British losses to May 31 had aggregated 258,000, as follows: 3300 officers and 47,000 men killed, 6500 officers and 147,500 men wounded, and 1100 officers and 52,500 men missing.

[Notes on the War. *Army & Navy Jour,* June 12, '15. 200 words.]

Premier Asquith announced in the House of Commons the British losses to May 31. These are approximately 3300 officers killed and 6500 wounded; 47,000 enlisted killed and 147,500 wounded; 1100 officers and 52,600 enlisted missing. During the week ending June 5, the casualties were about 900 officers and 20,000 men. At Neuve Chapelle in March, the losses were approximatly 13,000 killed, wounded, and missing. The proportion of officers killed to wounded—one to two—is notably high.

[Loss of Life in the British Troops. *Arms & the Man,* July 8, '15. 175 words.]

The ratio of killed, wounded, and missing is 1 to 4.25 or 23.5 per cent; in no previous war has so high a ratio been reached. The ratio of killed and wounded among officers is higher than in the case of the men: 3327 officers, and 47,015 n. c o. and men have been killed.

[Notes of the War. *Army and Navy Jour.*, Sept. 18, '15. Quoted.]

"The total of British army casualties in the war up to Aug 21 was 391,913 officers and men, killed, wounded or missing, it was officially announced in the House of Commons on Sept 14. Detailed figures follow: Killed and died of wounds, officers, 4965; other ranks, 80,922; wounded, officers, 9973; other ranks, 241,086; missing, officers, 1501; other ranks, 53,466."

[The War in Europe. *Army and Navy Jour.*, Sept. 25, '15. 100 words.]

Of the total British loss of 381,893 to the middle of September, approximately 76,000, almost exactly 1-5 of the total, were killed or died of wounds. This proportion has remained practically constant, as has that of casualties among officers to those among men—approximately 5%.

[Army Notes. *The Army and Navy Gazette,* Sept. 18, '15. 375 words.]

The statement of casualties (British forces) brought down to Aug. 21, 1915, and including advance from Suvla Bay, makes the total, killed, wounded, and missing 382,000.

The proportion of killed to wounded is

much higher among the officers than among the other ranks—one officer killed to two wounded, while for other ranks the proportion is one man killed to 3.4 wounded. No sickness statistics have been published, but it is believed that British forces in France are remarkably healthy, no epidemics and no outbreaks of enteric.

About 59% of the wounds are classed as slight, therefore the casualties sound more terrible than they really are.

—Losses—From Artillery and Infantry Fire Respectively

[Current Notes on the War. Editorial. *Artill. Monatshefte,* June, '15. 4500 words (total).]

Gen. Percin, French Army, states that the losses due to artillery fire have increased considerably. In the East Asiatic and the Balkan Wars, the losses from artillery fire were from 10 to 20%. In the present war they are over 35% for the French, and 45% for the Germans. An earlier report gave them as 60%, which was too high because it was based on seriously wounded only, whereas most light wounds are produced by small arms fire.

In a French hospital containing 4286 wounded, 91.1% were infantry; 5.4% artillery; 3.45% other arms. In former wars the proportion was:

MANCHURIAN WAR

Russians	.94 % Inf.	3 % Art.	3 % others
Japanese...92.3%	Inf.	4.1% Art.	4.1% others

WAR 1870-1871

Germans...91%	Inf.	4.8% Art.	4.8% others

Gen. Percin believes that the proportion of infantry to artillery in the firing line is about 5 to 1. Gen. Rohne disputes this, and shows that it is nearer 8 or 9 to 1.

—Machine Guns in

See

MACHINE GUNS—USE OF IN EUROPEAN WAR

—Military Lessons of the

[Lessons for us from the European War. Editorial, *Heiji Zasshi.* Jan 15, '15. 2000 words.]

The European War has given a great lesson, and especially has the grand activity of Germany excited our admiration. If German diplomacy had been a little more successful so that she would have been opposed only by Russia or France, who can doubt her grand victory?

The magnitude and completeness of her economic preparations are wonderful and many critics argue that future wars will be decided, not by the victory and defeat of troops, but by economic conditions.

At any rate, we must look to our economic preparations, if we should plan war. We need provisions for mobilizing and training the forces of our entire country, and we must have laws prohibiting the destruction of our products and industries, bankruptcy laws, and laws allowing the free importation of military and other necessary articles from foreign countries.

When we observe the great attention which Germany has given to these points, we can at once see their importance There is no doubt that she, with her wealth as a basis, planned every economy and safeguarded every necessity as against this day.

Mobilization is the foundation for plans of operation, and the completeness of her scheme in 1870 and the imperfections of those of the French were the main causes of the latter's quick defeat. This is, likewise, the foundation of her success in the present war.

Then comes her system of communications. Hardly had she completed her mobilization, when we heard that her troops had crossed the Belgian frontier. This was due to her excellent railway system which is organized not only with designs on the French, Belgian, and Dutch frontiers, but not forgetting the interests of her people in times of peace.

Her manner of providing clothing, ammunition, and arms also calls for praise and its completeness indicates the determination of the government and people.

As a result of her preparations, the people, separated from the theatre of operations, are following their ordinary pursuits, the boys are receiving military instruction, and the older boys are occupying public offices. The entire people are united in helping to bring the war to a successful close.

[Lessons of the War. *Canadian Military Gazette.* Jan. 12, 1915. 800 words.]

The German Minister of War has issued instructions based upon experiences to the end of September. These instructions require choice of capable leaders, and caution against needless exposure. The greatest possible use of entrenchment is advised.

In infantry attack, the zone of artillery fire should be crossed under cover of darkness or fog. The enemy's artillery should be reached as quickly as possible, and every step secured by entrenching.

Cavalry horses should be hardened and accustomed in peace to the conditions of war. They should be able to make long marches at easy gaits, and the men should be able to use their carbines.

Artillery almost invariably operates from entrenched positions. Fire control and economy of ammunition are of prime importance.

Every possible effort should be made to train the aerial service for close co-operation with the general in command and with the artillery.

[New German Training. Learning by Experience. From (*London Morning Post*) *Jour. Military Service Inst., U. S.,* Mar-Apr, '15. 800 words.]

A copy of a letter of Sept 26, 1914, from the German Minister of War, addressed to commanding officers, came into the possession of the special correspondent of the *London Morning Post.* The substance of the communication was, 1st, counseling more caution in the infantry attack; 2d, "scrapping" the cavalry charge; 3d, development of intrenching by the artillery, and the exercise of fire control and the economy of ammuni-

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tion; and 4th, development of the aerial reconnaissance.

A translation of the complete document is given.

[Six Months of War. *Weekly Edition London Times,* Apr 2, '15. Extract.]

"With regard to the reserves, experience has verified the dictum of the Serbian and Bulgarian generals in the war of 1913, namely, that 'two months in the field are necessary in order to get at the full value of the reserves.'"

[Lessons of the War. *World's Work,* Apr '15. 500 words.]

Neither the aircraft nor the submarine has proven a deciding factor in the war. The British battle fleet is the controlling factor in the command of the sea, though exposed to probably the best submarine fleet operating in a most favorable field.

The aeroplane has more securely fastened upon the artillery the honor of being a deciding factor. Supremacy of the air means chiefly better service of the guns and better knowledge of the enemy's movements. Attacks by aeroplanes and Zeppelins have had little direct effect.

The automobile has been chiefly useful, not in direct attack, but in its services to the men and guns at the front.

[Lessons of the Present War from a Technical Point of View. By Hudson Maxim. *Scientific American,* May 15, '15. 1500 words.]

The main lesson of the war is the importance of applying labor-saving machinery scientifically in preparation for war, and the necessity for preparedness with men trained in the use of these machines.

The second lesson is that, after war is declared, there is no time to equip, and even if there were, the tremendous extravagance of preparing them is amazing.

Not one of the Allies was prepared, and, as a result, they have had to pay the highest prices for all kinds of munitions. One-quarter of this expense properly applied beforehand probably would have averted the war; but even if war had come under such circumstances, they would have been able to carry it on at vastly less cost in money, and Belgium and northern France would not to-day be in possession of Germany.

Had Belgium prepared as well as Switzerland she would have been able to delay the German advance until assistance came.

The lesson next in importance is the fragility of treaties. But this is only history repeated, and all history supports the allegation that nations know no law but necessity, and can be made to obey no other law in time of war. Treaties, to be at all binding, must have behind them the pledge of all nations to support them by force, and no one nation would dare break them, since the necessity of observing them would be greater than any other necessity.

The next lesson is the unreliability of all prophecies of pacifists, who, for a quarter of a century, have been telling us that human nature has so improved as to render war impossible.

The famous book of M. de Bloch, prophesying that the last war had been fought, led to the Hague peace conferences, and since its publication eight great wars have been fought, together with other minor guerilla wars, such as that now going on in Mexico.

A noted peace advocate stated, just before the present great conflict, that another war was humanly impossible, that the balance of power would prevent, and bankers would refuse the money.

While war is, of course, deplorable, all wars have benefited the nations engaged, notwithstanding the loss of life and expenditure of money. If we admit that all wars are bad, then we have all the more reason for trying to prevent them, and we know, if we know anything in this world, that there is only one way to prepare against war, and that is with guns and trained men.

[Teachings of the Present War. By Capt. Tonelli di Fano. *Riv. Mil. Italiana,* May, '15. 3800 words. One ballistic table.]

The important technical advances are in the use of heavy field artillery, airships for observation and for combat, armored automobiles, hand grenades, and shields for infantry.

Heavy artillery is used against both animate and inanimate targets, and is sent by the Germans with the advance guard. It has been very effective against fortresses, which can no longer be considered more than points of support for the field army.

The aeroplane is the most generally useful form of air machine. For distant exploration both aeroplane and dirigible can be used. For close observation swift aeroplanes are best. They are used for correction of artillery fire and for general communication. Large and small dirigibles, carrier pigeons, and kites, are other possible means of communication.

For air fighting and throwing bombs, use is made of swift aeroplanes having several seats, or those with two seats and greater cargo capacity, or dirigibles. Actual combat in air is inevitable at times.

The Germans drop small sacks of lime to the ground to make marks by which to direct flight and drop projectiles. Steel arrows have proved effective against columns of troops and wagons. The aeroplanes carry 500 or 1000 arrows, 6 in. long, weighing ½ oz. each.

To secure effective results the headquarters of an army should have 2 large dirigibles and 15 to 20 aeroplanes; an army corps should have 8 to 10 aeroplanes; an infantry division, 5 aeroplanes; a 1st class fortress, some dirigibles and 8 to 10 aeroplanes; and a 2d or 3rd class fortress, the same without the dirigibles.

To oppose the enemy's air operations, there will be need of aerial stations at important points, aerial guards to attack hostile machines, and special means of lighting cities, positions, bivouacs, and camps.

Artillery for use against airships must be capable of elevation to 80°, of rapid aim, of being loaded in any position, and of rapid transport. It must also use special projectiles that can be followed by the eye, by means of successive bursts or otherwise.

Armored automobiles have exceeded expectations. They are protected by shields of chrome-nickel or tempered steel, 3 mm. thick. For crossing ditches and trenches they carry two extra pairs of wheels on movable frames. By extending the frames, one extra pair of wheels can be placed 12 ft. in front of the regular front wheels, and the other extra pair a like distance in rear of the regular rear wheels. Ditches of a width equal to the wheel-base of the automobile can be crossed.

The use of hand grenades is a return to the past. Two kinds are used—one to wound, and one to asphyxiate or stupefy. The latter have been notably effective. The charge is "ammonal," composed of ammonium and barium nitrate, of the color and consistency of glue. Its explosion liberates gases, among them nitrogen peroxide, which alone produces death, or, mixed with air, produces unconsciousness.

In tactics, the great development is trench work. Battles are no longer fought on the ground, but under the ground. Complicated systems of trenches are used, and field war is like a siege operation. Aeroplane observation has forced the use of night attacks.

Fronts are strongly occupied, with sometimes as many as 15 men to the meter.

[War Experiences and Observations. Comments on "The Note-book of an Attaché." *Army & Navy Jour.*, July 3, '15. 900 words.]

(Note: Much of this comment covers parts of the book non-technical in character.)

The German infantry shoot poorly, but better than the French. The British are the only troops that shoot with any degree of excellence. A British battalion of 1100 men has usually a fire effect equal to that of a German regiment of nearly 3000.

The German helmet is easily the best headgear in the matter of invisibility. It fits tightly on the head and casts practically no shadow. It is made of lacquered leather, sheds water perfectly, is nearly indestructible and gives excellent ventilation by holes under the spike. The equipment of the German soldier is a marvel of perfection in every detail.

The British hat is the most conspicuous headgear, and shows distinctly in the trenches.

The importance of machine guns for infantry is emphasized.

[The Fighting in Europe. Current Events and Comments. *National Guard Mag.*, July, '15. 600 words.]

The present status of the European war illustrates the value of preparedness. Germany and Austria were prepared and have managed to keep most of the fighting in the Allied territory. Russia has suffered serious reverses as a result of shortage of ammunition, trained officers and men. The French are having trouble in ammunition supply, due somewhat to loss of mining and industrial areas, but also to undreamed-of expenditures of artillery ammunition. Great Britain has increased her ammunition production many fold, but is still far short of the requirements.

After eleven months of preparation, we are furnishing 1 per cent of the ammunition requirements of the Allies. The bearing of this fact upon our own situation in the event of war is obvious.

[How France Estimates England. *Literary Digest,* Aug 28, '15. 1200 words.]

(Note: Most of the article is French newspaper comment to the general effect that France is satisfied with the part England has taken in the war. The following comments by Gustave Hervé in the *Guerre Sociale* are of interest.)

Much artillery and ample ammunition must be collected in one spot. The use of barbed wire must be learned from the Germans. It is said that in Poland the Germans have used barbed wire defenses three or four miles wide. The Germans use the machine gun with great skill, and all letters from the front indicate that this weapon is more feared even than heavy artillery or asphyxiating gas. The German machine guns, light and simple, are superior to the French machine guns, which are heavy and complicated. The morale of the French troops is good after ten months of work, but "it would be too severe a test for our (French) troops to be drenched by the rain next fall in the same trenches they were in last year."

[Position and Trench Warfare, the Weapons Used and their Origin. By Major. Gen. v. Richter, German Army. *Artilleristische Monatshefte*. May, '15. 3200 words.]

The present trench warfare was not foreseen by any one. It has created absolutely new conditions, brought into use new weapons, revived old ones, and brought forth new methods in their use. The use of cover in connection with increased fire effect has greatly increased the power of the defense. The attack will not succeed unless the defense has first been completely shaken. This war is more personal than former wars and necessitates close individual combat. Never before has human ingenuity been so taxed to devise and apply so many murderous instruments of combat. In spite of the great loss of life, it seems that the end is as far off as ever.

The modern saber, bayonet and lance are the successors of the ancient instruments of a similar nature appearing in the Stone, and later in the Bronze and Iron Ages. Scottish regiments have used the dagger; Indian troops, the throwing knife, a successor to the javelin. The modern rifle represents the culmination of the same idea found in the sling-shot, later in the bow and arrow, and in the cross-bow. Another variation is the aero-arrow used by the French and English. The revolver is the successor of the pistol. The flat trajectory of the modern rifle has brought about the use

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of new means to reach troops under cover. The ancients used the ballista and the catapult. The first mortars used also fired stone projectiles. The modern howitzers resemble in their ballistic properties the first guns that were used. Large caliber mortars have been developed, such as the 42 cm. mortars. Their life is very short. The machine gun is the successor to the Gatling gun. The use of trench mortars and hand grenades dates back to the 16th century. The Japanese were the first to revive their use. Asphyxiating bombs and shells find their prototypes in the "stink bombs" of mediaeval times. The use of shields both for infantry and artillery has also been very extensive. Personal armor has not been adopted, excepting the helmet. The use of these new means of protection is admissible where troops are not required to maneuver very much, but in order to provide them, large ordnance and munitions parks must be near at hand. The more determination shown by one side in holding the positions, the more unscrupulously will the other side resort to every means in order to attain success.

["The Great War." *Indisch Militair Tydschrift*, No. 7, July, '15. 10,000 words.]

(This article is in the form of a diary written by a Dutch India Field Officer, in which he relates his experiences in the Netherlands and gives an account of his services in connection with the Great War from Aug. 1, 1914, to Apr. 14, 1915.)

[Lessons of the European War, Anonymous. *Kaikosha Kiji*. July, '15. 6000 words.]

I. A large army in war time requires the maintenance in peace time of a strong and efficient nucleus.

Germany had a standing army on a peace footing of 50 Divisions (782,000 men). Upon mobilization, the Reserve was organized into at least 37 or 38 Divisions and the Landwehr into about 12 Divisions, thus making a total force of about 100 divisions (2,000,000 men).

In the infantry, which comprises the greater part of this force, the general principles of employing the personnel for expansion purposes are as follows:

In the regular regiments, all the field officers and the company commanders except one or two from the Reserve are officers on the active list. As for platoon leaders, each company has one regular officer and the others are officers of the Reserve and Landwehr and warrant officers of the active service.

Non-commissioned officers and privates of the Reserve are sprinkled throughout the regular troops with very good results.

In the Reserve regiments, all the field officers and more than half of the company commanders are regular officers, while the platoon leaders are in about the same proportion as in the Field Army. Non-commissioned officers and privates are mostly from the Reserve, but there some Landwehr men and a very few regulars.

In the Landwehr regiments, the field officers are almost all regulars and the company officers are on an average of one regular officer to each company. Some non-commissioned officers and privates of the Reserve are sprinkled through the ranks.

At the first mobilization in addition to organizing the pre-arranged regular, Reserve and Landwehr troops, Germany took two companies from a regular regiment and some regular depot troops and by using Reserves for the major portion, created brigades and divisions. During the latter part of August, at least two of these divisions proved themselves superior in efficiency to the Landwehr divisions and at least equal to those of the Reserve. She also gave about two months instruction to the volunteers and poorly instructed men, added a few Reserve men, and, about the last of September, 1914, organized 6 new Reserve Army Corps. In October, 1914, these were sent to the firing line. She continued organizing these corps and early in February, 1915, four more were sent to the front, and about May, it is said that she had twenty of them. In this way, for the war in Flanders in the west and around Lodz in the east, she had about 130 divisions (2,600,000 men), and in the course of three or four months obtained a force of 174 divisions composed of the following:

Regular troops	50	Divisions
Reserves	42	"
Newly organized troops	40	"
Depot troops	10	"
Landwehr	30	"
Navy	2	"
Total	174	"

From November to January, she used about 12 divisions of Ersatz troops in addition to the above, in the vicinity of the firing line.

Austria-Hungary's peace-time strength, counting all forces, was 49 divisions, which has been increased to about 70 divisions (1,600,000 men).

Russia started with a standing army, peace footing, of 79 divisions (1,033,000 men) which by March or April had been increased to about 130 divisions (3,000,000 men).

France had a standing army of 49 divisions (721,000 men), which by the end of November 1914, had been increased to 100 divisions (2,000,000 men). About February, two divisions each of 1st and 2d Reserves were organized but these are being used to fill up the troops in the field.

England had as a peace strength in the home country, counting all forces, about 550,000 men. First of all, she sent to France 6 divisions (120,000 men) which during October and November, 1914, were increased to 11 divisions (220,000 men), including the Indian, Australian, Canadian, and New Zealand troops. Up to March, these had been increased to 15 divisions.

Germany planned to organize the greatest number of troops possible should war come.

Austria-Hungary made no such plans, and although her personnel was large, it was unprepared for this. Putting forth every effort

possible, she could send to the firing line only 1½ times her peace strength.

England immediately planned the organization of new troops, but she has not yet sent them because of her inability to get them ready for service.

During this time. Germany has put out over 30 divisions of absolutely newly organized troops. She has also expanded her army to 3½ times her peace strength, which she could not have done if, in time of peace, she had not prepared to meet the demands of war by maintaining a large and efficient nucleus upon which to build.

II. It is difficult to accomplish one's object with inferior troops.

This is amply illustrated by the conduct of the newly organized German troops assembled in Belgium early in October, 1914, for the purpose of striking the Belgian and English armies. When, after continuing the fierce attack day and night it finally failed, the force was increased and the direction changed towards Ypres and desperate fighting continued to the middle of November without avail. This failure was partially due to the difficulties of the terrain for the offensive and because the Allies counter-attacked, but was principally due to the German forces being composed of most imperfectly instructed young men (at most they had had only one month's instruction), augmented by a few old men.

Their scouting was most imperfect, the attacking line was too dense, they advanced without fire superiority, and did not maintain the necessary reserve.

Instances of fearful losses due to similar causes may be found in the German campaign in East Prussia.

III. Cavalry—Its duties and its importance have in no way decreased.

It is a great mistake to suppose that we have no further use for cavalry because we have no evidence of its having given a crushing blow by mounted action. In this war, the cavalry has been burdened with most important duties. When, in late August, 1914, the victorious Germans were fiercely pursuing the English and French, the German cavalry was not allowed to perform its proper functions because it had to be withdrawn and thrown against the English, who held a line running through Ostende and covering the landing point for reinforcements.

Again, when, during September, the Germans withdrew to their positions at Soissons and Lens to operate against the Allied left, the Allies tried to crush the German right and this caused an extension of the line of battle to the sea. The German cavalry by their mobility performed especially conspicuous service on the German right, where it successively seized and held important points until the arrival of the infantry.

In the East, in scouting, in keeping in touch with the enemy, in gathering information, and in keeping contact between parts of the army, the cavalry has been invaluable.

The war has proven that its sphere of usefulness is broad, that its existence or nonexistence will greatly influence results, and that its importance to the other branches has not in the slightest decreased.

IV. The influence of railroads on military plans.

Just what influence railroads have on military plans is most clearly shown, first in the mobilization of the troops, and later in their movements from one threatened point to another, extending the line here or reinforcing it there. The war in the West from the middle of September to the middle of October, 1914, was, in a way, a war of the railroads.

Both in mobilization and in movement of troops, the Teutonic Allies showed great skill in their use, while the Russians by their lack of preparation in this respect were always forestalled.

[Flanders and Plevna: a Comparison. By "Bellfield." *Jour. Royal Artillery*, Aug., '15. 2700 words.]

In view of the fact that trench warfare has played such a prominent part in the present campaign, a comparison of the modern system and the system employed in the Russo-Turkish War of 1877 is not without interest.

Plevna was taken because the works constructed there were field fortifications thrown up as required before there was any thought of investment, which is a parallel case with what has happened on the front between Soissons and Nieuport.

There is of course the great difference that Plevna eventually was reduced to a siege, but the fact that the Turks were cut off from all outside supplies had no effect on the methods of trench warfare since there was abundant ammunition to the last, although the food supply was ultimately exhausted.

1. *Field works*

The Turkish works consisted of a series of redoubts connected by lines of fire and communication trenches. The redoubts were earthworks of no regular design, as a rule thrown up on commanding hills or ridges, the distance between them being about 1000 yards. Elaborate bomb proof shelters were constructed by the Turks. On the other hand the Russians trusted to the cover of the trenches, and as they approached the enemy's lines, concealed their trenches by brush and shrubs. Immediately any advance was made, hasty entrenchments were thrown up or the captured line was remodeled. Only at one point was sapping done.

In the present war the trench work is very similar, the main differences being in a resumption of sapping and the disappearance of redoubts. Their place is taken by concealed strongholds or points d'appui.

2. *Artillery tactics*

The objectives sought by the Russian artillery fire in 1877 were:

(a) To silence the enemy's guns.
(b) To destroy his works.
(c) To inflict losses on his personnel.

Modern artillery may be said to have exactly the same ends.

The expenditure of ammunition is much greater, and the employment of indirect fire

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being the rule, it is possible to bring fire even at night upon the enemy's lines and upon his communications in rear from long ranges. The Russian practice of preceding an assault by a heavy and sustained artillery fire is the practice now.

3. *Guns and ammunition*

The guns at Plevna were of small size and were supplied with shell and shrapnel. The Russians had 10% shrapnel and the remainder a segmental shell of low explosive power. The effect of the shell was small, and as a result of the lessons of the war of 1877, the proportion of shell carried with field guns was reduced. On account of the ineffectiveness of shrapnel in the present trench warfare, the shell again has come into general use for the following reasons:

(a) Its need in the destruction of obstacles.

(b) Its great explosive effect.

(c) The increased accuracy of modern guns aided by aerial observation of fire enabling a greater proportion of hits to be scored.

(d) Greater rapidity of explosion due to improvement of fuses.

4. *Obstacles*

No artificial obstacles were used at Plevna. The Turks relied entirely on ditches and rifle fire. In the present war every trench is protected by masses of wire entanglements. The fire of the Russian artillery was not effective in keeping the Turks in the trenches under cover, hence the need of obstacles was not apparent.

5. *Communications*

In these days the massing of troops or the sending up of reinforcements is carried out by rail or motor transport, neither of which was available at Plevna.

6. *Weather*

The weather conditions were similar in both campaigns, and their effect on operations has been the same.

Other means of attack and defense, such as machine guns, hand grenades, and mines, which have played such an important part in the present war, were not used during 1877.

[The War on Land. By a military officer. *Army and Navy Gazette*, Aug. 21, '15. 1500 words.]

Wednesday, Aug. 18, 1915.

On the Western Front:

Trench warfare has upset many preconceived opinions on war. Fights are settled by hand to hand work, personal prowess being the deciding factor. Also it would seem that we may yet see armor used habitually by our men. Field and machine gun detachments appreciate the shields which now form a normal portion of the equipment. An infantry shield so fashioned as to be suitable for a breast plate and also readily fixed in the ground will have its uses. The French continue to successfully withstand all attacks and in mining operations frequently get the better of their opponents. Sapping and mining used to be a strong point in the French army and the traditions then established have never died out and are now bearing good fruit.

The Dardanelles:

The two new landings which have been effected at Gaba Tepe and Ari Burnu must shortly make the Allied position much more favorable, though there has been no official pronouncement of any further action in this quarter.

No news has been vouchsafed as to the landing at Kara Chali, but according to Berlin it was repulsed. Probably only a diversion, as Berlin puts the Allied loss at only 35 men. Signs are not wanting that efforts in this direction may soon assume considerable proportions, seriously threatening the line of communication of the Turks on the Peninsula.

The Italian Theatre:

The Italian Press states that the Generalissimo has expressed the opinion that Trieste ought to be reached by the end of the month. In the mountainous regions advance must be slow, on account of the fearful difficulties encountered.

The Italian troops having been specially trained in mountain warfare are accomplishing wonders, and it is possible that shortly the supply of similarly trained men in the German and Austrian ranks may become exhausted. Experience has shown that men accustomed to the plains only, take a long time before they can march or climb in a hilly country, and, at high altitudes, they are almost useless.

At the outbreak of war, there was much apprehension as to the safety of Venice, but though there have been air raids, little damage has been done and the recent sea-plane attack effected practically no useful object.

The Eastern Theatre:

It will be interesting to learn how the Germans adapt the Russian railways to their own use. Had they at the beginning of the war a supply of carriages or under carriages of the Russian gauge, or have they altered the Russian gauge to suit their rolling stock?

We may be sure that all of this was worked out beforehand, and it is probable that thorough preparation in this direction will enable them to accomplish the apparently impossible task of maintaining adequately in munitions and provisions an advancing line hundreds of miles in extent.

The Balkans:

Everything points to a fresh advance against Serbia and the preliminary bombardment of Belgrade and adjacent lines of defense has already commenced. Intended to impress Roumania and Bulgaria, the future action of these two countries is a matter of extreme moment, and the diplomatists on both sides are all endeavoring to win these two countries to their side.

It is only necessary to glance at a map to appreciate the strategic significance of Roumanian territory.

Roumania has declined to allow munitions to pass through her territory, but if she could

be frightened into a less rigid neutrality, the Allied difficulties in Gallipoli would be seriously increased.

It would be folly to underestimate the importance of the Russian retirement. Some military writers maintain that it makes little difference, as the straightening of the Russian lines is really a gain and that the supply of the army has been facilitated by drawing nearer its base.

This does not bear critical examiniation. Russian traditions support the view that a retreat may often be a prelude to a victory.

[The War on Land. By a Military Officer. *The Army and Navy Gazette,* Sept. 11, '15. 7000 words.]

Wednesday, Sept. 8, 1915.

The immense range of modern ordnance, the accuracy of its fire, and the possibility of observation of fire by means of air-craft, have added enormously to the difficulties whch have to be overcome. Not so long ago a spot five or six miles from the firing line was considered fairly safe, and if defiladed from view, was practically absolutely safe, except for stray shots. But now all the ground up to the extreme range of the weapon is liable to be bombarded at any time. It is stated that the Germans have effectively bombarded certain places at a range of nineteen miles. It must be remembered also that, with modern weapons and appliances, effective fire can be delivered at night or in a fog once range and direction have been definitely fixed. The enormous difficulties to be overcome in bringing up supplies to the fighting line are manifest.

In the case of one force retiring and another pursuing, the system of outposts to be adopted is a problem difficult of solution, and it would appear that all of our preconceived ideas on this subject must undergo complete revision. In South Africa we were able to ensure adequate security by placing the main body of troops in a hollow and picketing the surrounding hills. Under modern conditions the aeroplane would give away the location and the force, and guns from a distance would shortly render it untenable. In the instance taken, the pursuers would not always have guns of the heaviest calibre immediately available, but, thanks to motor traction and other mechanical devices, guns of considerable weight can keep up with advancing troops, and they can be supplied with ammunition, provided always that there are roads available or that the ground surface is such as to admit of movement over the country. Even when rail tracks and tramways are available or have been constructed, their use within a range of seventeen miles of hostile guns is fraught with danger, and they are liable to be damaged at any moment. Repairs can be effected only at night when in range of artillery.

[Military Notes. By French Correspondent (J. G. B.) *Army & Navy Jour.,* Oct. 16, '15. 800 words.]

Reports as to friction between the British and French are erroneous. The organization of the French and British armies differs and usually French officers have larger commands than British officers of equal rank. The division is about the same strength in the two armies—20,000 men—but comprises two French brigades and three British. A French colonel commands 3,200 men and a commandant of battalion 1000, whereas a British brigade (4,000) is commanded by a brigadier general, and a battalion (1000) by a lieutenant colonel. Losses may have altered these figures.

Although formerly a retreat was regarded as the beginning of ruin, both Joffre and Grand Duke Nicholas have undoubtedly saved their armies by retreating until battle could be offered on more favorable terms.

The value of permanent fortifications is beginning to be doubted. The Russian fortresses have suffered the same fate as those in Belgium and France. Verdun has been held, not by its permanent defenses, but by the system of trenches around it. Engineers note that captured fortresses were inferior in range and caliber of artillery and in aeroplane reconnaissance to the attacking force. With these elements equal, there may be a different story. But permanent fortifications on the old lines may safely be said to be a thing of the past.

The aeroplane has improved considerably in carrying capacity, speed, and general design since the war began. France has a lead in this respect, and large appropriations for new construction of improved aeroplanes indicate that she intends to maintain this lead.

[The War in Europe. Note. *Army & Navy Jour.,* Oct. 30, '15. 100 words.]

Organizations which have suffered severe losses have not been again used in action until numbers and morale were restored. In the recent attack in Champagne, enough troops were at hand to allow detachments that had been badly shot up to be replaced by fresh troops.

[The War in Europe. *Army & Navy Jour.,* Oct. 30, '15. Quoted.]

"The terrific bombardment of the German trenches preceding the great attack in Champagne in September was maintained for seventy-two hours. As rest or sleep was impossible at the front, troops who were to be used in the advance were moved to the rear that the order to charge might not find them exhausted. They were brought into the front line positions again refreshed and physically fit to do their utmost.'

[Observations of a French Expert. From a letter by Col. Felix I. D'André, published in the New York *Sun. Army & Navy Jour.,* Nov 27, '15. 1000 words.]

The infantry is the principal arm, and all others—artillery, aviators, sappers, intendents, doctors, etc.—are auxiliary. A nation lives or dies by its infantry. The victory of the Marne was won without heavy artillery. In many actions, the French infantry has proved its worth, but the greatest strength lies in proper co-ordination of the various arms. The in-

EUROPEAN WAR—Continued

fantry losses are heaviest—as high as 60 per cent in men in some cases, and 80 per cent to 100 per cent in officers. Other arms have not suffered more than 10 per cent losses.

The present war consumes an enormous amount of ammunition. The trench is impregnable when manned by good shots, and a machine gun served by an expert shot is the deadly weapon par excellence. The strength of a fort is in the troops who defend it. The mobile defense of a fort (infantry with its fire and mobility) is stronger than fixed defenses (artillery and engineering with fire only). Money should not be spent on concrete and steel, but on infantry and its auxiliaries—particularly on infantry trained in the use of the automatic rifle, machine gun, grenade, pick and spade, electric wire, bayonet, etc., but, above all, in mobility and tactical employment.

Markmanship is necessary for both infantry and artillery. The latter should fire 100 to 150 rounds per officer per year, for it is better to have no artillery than inexpert artillery.

Non-commissioned officers of other arms are being taken to supply officers for the infantry. The fifteenth and sixteenth classes of recruits have all been absorbed by the infantry. Not a man has gone to the cavalry or artillery.

See also

FIELD ARTILLERY—USE OF IN EUROPEAN WAR—LESSONS FROM
FORTIFICATIONS—FIELD—TACTICS
UNITED STATES—MILITARY CONDITIONS (Article: "Recent Defensive Developments in War.")

—Military Lessons of the—Compulsory Military Service

[The Value of Compulsory Service. *Armée Zeitung* (Vienna), July 29, '15. 450 words.]

With increasing fury the war continues, great gaps in the ranks are filled by, as well as new armies created in, our training barracks and our mobilization centers. The thought is already expressed in words: "If these young men with two or three months' service can go to the front, why the inevitable enforced service in time of peace?" It is not too early to combat this thought. The best troops in the world would do us no good now had there not been seasoned veterans to withstand the first onslaught of the war. Had we been able to assemble our full strength at the beginning, the state of the war would be quite different now. The standing army alone allowed us to build up our second line. Do not estimate the regiments now going forward as recruits; up to one-third of an organization is composed of veterans of one or more wars—a powerful leaven for the others. Such troops have nothing in common with militia, and the war of to-day is in no sense an argument for the principle of militia.

[Military Notes. By Paris Correspondent. *Army & Navy Jour.*, Aug. 14, '15. 2200 words.]

The Germans underestimated the value of the French troops, and thus adopted a faulty strategic plan. The French were unprepared and without modern heavy artillery or efficient fortifications. They also underestimated the strength and mobility of the Germans and adopted a faulty strategic disposition. The Battle of the Marne was regarded as decisive, and France entertained the delusion that the Germans would be defeated through shortage of food, ammunition, and finances.

Everybody sees the situation now in a clearer light. Germany can only be defeated by superior military force, a condition now sought through feverish activity in the French and British factories.

An adequate supply of ammunition is necessary to avoid frightful losses in badly prepared frontal attacks.

Although the advantage in population rests with the Allies, only trained soldiers count in the line of contact. The only barrier to complete victory for Germany has been the trained troops of France. Thus the Allies have been saved by French conscription.

Conscription is valuable as a school of patriotism, and perhaps even more valuable as a means of mobilizing the industries of a nation, a very necessary feature of modern war. The difficulties of Great Britain in mobilizing industry could not occur in a country where conscription prevails. It is only necessary to consider what would have happened had anything like the coal strike been attempted in France or Germany.

Finally, voluntary service can never produce the homogeneity of a force that results from universal service.

—Military Situation

[Crucial War Situations as Autumn Begins By Frank H. Simonds. *Review of Reviews*, Oct. '15. 4000 words. Illustrated.]

I. *Statistics of the war.* From the best information at hand, the forces put into the field in the first months of the war totalled about 4,500,000 on each side. The present numbers are: in the Western theater, 1,500,000 Germans against 2,000,000 French, 750,000 British, and 100,000 Belgians; in the Eastern theater, 1,500,000 Germans and 1,000,000 Austrians facing 1,500,000 Russians; in the Southern theater, 500,000 Austrians against 750,000 Italians and 150,000 Serbians. In the Gallipoli Peninsula it is believed that about 350,000 British and French troops are operating against a Turkish force not exceeding 150,000.

II. *How long can it last?* By the arithmetic of war, it is believed by the Allies that by the winter of 1916 the relative strengths in the field will be such that the Germans will have to contract their lines.

III. *Peace talk.* A discussion of peace rumors as showing the attitude of the belligerents toward the final result.

IV. *Constantinople, the real prize.* With Constantinople in the hands of the Allies, and the Balkan States strengthened and at the mercy of the sea powers, German plans for expansion in that direction would be thwarted.

On the other hand, with Constantinople in the hands of the Central Powers, their expansion to the south-east would be no longer menaced by sea power. Thus is seen the tremendous importance of Constantinople to both sides.

V. *Gallipoli operations.* The progress of the Allies is very slow, and heavy losses show desperate fighting. The German advance through Serbia will require perhaps a month or six weeks. Reports indicate that the Turkish power of resistance is slowly wearing out. A decisive engagement in that quarter within that time is a possibility.

VI. *The Russian Grand Duke goes.* Much comment has resulted from the relief of the Grand Duke. Outside Russia, his military skill was everywhere conceded. Despite all handicaps, he had saved his armies, but he had not been able to save the provinces. Whatever the explanations, the appearance of the Czar in the field would have a moral effect upon Russia. The going of the Grand Duke does not mean that Russia is going to quit the field, nor does it seem to mean any immediate danger of Russian disaster.

VII. *A slackening campaign in the East.* September saw a slackening of the Austro-German campaign in the east. From Riga to Dvinsk, Gen. Russky held the Germans in check, and in the south, west of Tarnapol, the Russians scored some successes over the Austrians. In the center, the German advance still continued. There is no longer apparently a chance of decisive action along this front. The escape of the Russian armies is assured, and by the end of October the campaign will come to a standstill.

[Lord Kitchener on the War. *Army & Navy Register,* Oct 9, '15. 2000 words.]

(*Broad Arrow* gives a full account of a speech delivered in the House of Lords by Field Marshal Lord Kitchener on Sept 15. We give here a few of the more important points made.)

1. The western front has been much strengthened by developing the trenches, and by a large increase in the number of heavy guns emplaced.

2. The German use of gas and liquid fire no longer has the effect of surprise.

3. The fresh units sent over to Sir John French are well officered and commanded. The equipment is good and efficient. The artillery is fit to take its place in the line.

4. The French trenches are now impregnable. Their aircraft have been particularly active.

5. The Germans have failed to destroy the Russian Army: it is still intact as a fighting force. The Germans have to their credit certain fortresses captured at an enormous sacrifice of life, but their strategy has failed. and their victories may prove to be defeats in disguise.

6. The Italian Army now occupies strategic positions of first-rate importances.

7. Operations in the Dardanelles have been conducted under enormous difficulties. In a humane point of view, Turkish methods of warfare have been according to the recognized laws of war.

8. In Mesopotamia, the Turks have been consistently defeated, losing their entire artillery, besides large quantities of stores, munitions and other war material.

9. In South Africa, General Botha has carried operations to a victorious end.

10. The response of the country to the call for recruits has been most gratifying; but nevertheless the prospects for 1916 are causing some concern. However, it is believed that under the registration act, it will be possibe to compute the resources of the country and then determine the numbers that will be available for the army after providing for the necessary services of the country, as well as of munition works.

11. Whatever sacrifices may be required by this gigantic war, Lord Kitchener has no doubt will be cheerfully undertaken by the people.

—Mining Operations

See also

ARRAS, BATTLE OF—WORK OF ENGINEERS IN

—Motor Transport

See

MOTOR TRANSPORT—USE OF IN EUROPEAN WAR

—Munitions

[Reorganization of Industry. From speech of Mr. Lloyd George. *Sphere,* July 3, '15. 200 words. Illustrations.]

When fully organized, Great Britain and France, without reckoning Italy and Russia at all, can produce more munitions than the Teutonic Allies. Great Britain has been divided into ten munition areas, each under the management of a committee of local business men. Officers from the ministry of munitions will be attached to each headquarters, and they will have samples, specifications, etc.

[Notes of the War. *Army and Navy Jour.,* Oct 16, '15.]

An American engineer returned from Petrograd states that twenty train loads of munitions are lately arriving each day from Japan via the trans-Siberian railroad. The road is being used almost exclusively for transport of munitions.

See also

EUROPEAN WAR—AMMUNITION

—Munitions—Orders for in United States

Full details of the contract recently awarded by the Imperial Russian Government, to the Canadian Car & Foundry Company, with main offices at Toronto, Canada, amounting to a total of $83,000,000, calling for 5,000,000 shrapnel and howitzer shells at an average cost price of $17.85 for each shell, together with the names of the various American steel and powder mills which have already begun the manufacture of various parts of the order on subcontracts, and the respective values of such subcontracts, both awarded and pending, were given in the *Journal of Commerce* of Apr 21. It was announced that subcontracts to the extent of $21,724,400 had already been awarded

EUROPEAN WAR—Continued

or sublet by the Canadian company to a total of 37 American steel and powder concerns located in all parts of the country, and that four other contracts, totaling in value $30,104,-330 were pending. The *Army & Navy Jour.* (May 22) states that deliveries are called for at the rate of 20,000 a day.

[War Contracts in the United States. By Charles F. Speare. *Review of Reviews,* June '15. 3500 words.]

The European war has developed an enormous demand for war supplies of all sorts. The earliest contracts placed in the United States were for clothing and equipage, including means of transportation. Including the estimated shipments of March, the aggregate orders reached close to $200,000,000 and comprised among other items, 200,000 horses, 35,000 mules, $15,000,000 worth of explosive, and $3,500,000 worth of barbed wire.

The Bethlehem Steel Co. has taken large orders, and now employs 15,000 men. It has the only private plant in the United States equipped and designed for the production of heavy guns and shrapnel.

The U. S. Cartridge Co. has a contract for 600,000,000 cartridges. By the middle of May, war contracts for ammunition in the United States were estimated at $400,000,-000, and for foodstuffs, wearing apparel, horses, &c, at $500,000,000 more. The Canadian Car & Foundry Co. has an order for 5,000,000 shrapnel, partly sublet in the United States. Many concerns are taking up the manufacture of war materials by modification of plant, notably the car and locomotive works. The Westinghouse Electric Co. has one order for 2,000,000 rifles and expects another for a nearly equal number.

Not all the war orders are for direct military supplies. The Pressed Steel Car Co. is negotiating for an order from the Russian Government for between 20,000 and 30,-000 railroad cars.

[NOTE.—*Army & Navy Jour.,* July 3, '15. 50 words.]

The Colt Firearms Co. has decided to double the capacity of its plant at Hartford, Conn., to enable it to fill war orders for machine guns.

[Ammunition. NOTE.—*Army & Navy Jour.,* July 3, '15. 100 words.]

American manufacturers state that it will be August or September before shipments of war munitions reach full pace. It has required time to adapt the plants to ammunition manufacture. Six to ten months are allowed from date of contract to initial shipment on shrapnel and shell contracts.

[Note. *Army & Navy Jour.,* Oct. 23, '15. 100 words.]

Large orders have been placed in America for corrugated sheet metal, intended to construct shelter for the homeless. Inquiries have been made for prices on 50,000 tons of 1-3 in. plates, said to be for use in trench construction. The Allies are taking all the barbed wire that can be produced while the war lasts. A contract has recently been made for 10,000 tons of 11-inch round stuff for large caliber projectiles.

[The War in Europe. *Army & Navy Jour.,* Oct. 23, '15. 200 words.]

Exports of war materials from the United States to Europe—principally Great Britain, France and Russia—reached a total of about $21,000,000 for the week ending October 9.

[Orders for War Supplies. Editorial. *Independent,* Nov. 22, '15. 600 words.]

Based upon the demand for bonding by manufacturers and buyers, it is estimated that the total of war orders in the United States and Canada amounts to from 1½ to 2 billion dollars, of which about one-third goes to Canada. The representative of the British Minister of Munitions placed the total Canadian orders at $500,000,000. Among the orders placed are: Russia, $50,000,000 worth of cartridges, small arms, and machine guns; 5,000,000 yards of heavy woolen cloth in addition to an order for 1,500,000 yards already filled; 7500 freight cars in addition to 8500 previously ordered; 18,000 tons of steel rails ordered and in the market for 50,000 tons more; 300,000,000 feet of red oak for railroad ties. France, $60,000,000 worth of rifles and cartridges.

It is asserted that $70,000,000 worth of powder has been ordered from the Du Pont Co. Other items ordered are 11 very powerful aeroplanes, and 3100 tons ($6,200,000) picric acid. Among last week's contracts were 1,000,000 time fuses and 70,000 high explosive shells.

See also

EUROPEAN WAR—AMMUNITION
HORSES—EUROPEAN WAR—EXPORTS OF FROM UNITED STATES
MUNITIONS

—Neutrality Aspects of

See

NEUTRALITY—LESSONS OF THE EUROPEAN WAR
NEUTRALITY—VIOLATIONS OF—BELGIUM

—Peace Negotiations

[Dr. Dernburg's Peace Terms. *Literary Digest,* May 1, '15. 1500 words.]

In a letter to a German sympathizer, Dr. Dernburg suggests as the main terms of peace:

1.—Freedom of the high seas and "narrows."

2.—Open-door policy regarding colonies.

3.—If 1 and 2 are impossible, retention of Belgium.

4.—Return of German colonies.

5.—A free hand for Germany in Asia Minor.

On the whole these terms meet with no favor. The American Press is freely quoted to show that Germany gives up nothing in return for these demands. In some quarters "the discussion all comes back to Belgium," the retention of which by Germany is based not on commercial but on military needs.

—**Prisoners**

[The War in Europe. *Army & Navy Jour.*, June 26, '15. 250 words.]

Petrograd announces officially that on Apr 1 there were 10,734 officers and 605,378 men interned as prisoners in Russia.

Germany has about 1,000,000 prisoners interned in 247 camps scattered over the whole empire. Some of the newest camps have cost $1,000,000 each. The average cost of feeding prisoners is a little less than 15 cents a day.

Germany

[Prisoners' Camps in Germany. *Información Militar del Extranjero*, June, '15. 2500 words. *London Times*, June 5, 1915.]

According to a correspondent of the *Times*, there are 247 camps in Germany, 55 of which shelter from 10,000 to 20,000 prisoners each; and the total number of prisoners thus cared for reaches about 900,000. They are distributed throughout Germany, except in eastern Prussia, where the ravages of war still prevent the resumption of normal conditions. While this distribution appears to be of necessity, the impression also is that there are other motives. In the first place, they are accessible to the view of a large part of the German people, thus affording an object-lesson of the successes of German arms; in the second place, large numbers of prisoners are available for work on the farms and in the factories. All are in uniform, the brilliant French trousers being especially conspicuous. The prisoners themselves prefer active outdoor life, since it affords a measure of recreation, better food, and other comforts.

The distribution of the prisoners for work is made by arrangement between the local civil authorities and the commandant of the prison. A small wage is paid, running from about 15 cents to 35 cents or 40 cents per day, and this can be spent, under supervision, for food and extra comforts in camp. The amount is not given in cash, but in stamps or tickets which can be turned in at the camp canteen for their face value.

The *Times* correspondent states frankly that every facility was given him to visit and inspect all features of camp life.

The organization of the camps differs somewhat, but, in general, they are modeled and disciplined alike. The newest structures are of wood, which is now the only material allowed. The camps are generally placed on elevated ground to facilitate drainage, and have abundant water supply and electric lights. Sanitary precautions have been carried to the extreme limit. High wooden fences surround the camps, frequently in a double line, with sufficient space between to facilitate guard duty. The barracks have no windows, and skylights furnish light and air. In the newer buildings wooden bunks are placed with the heads to the walls, with a sufficient space between.

On the arrival of prisoners they are quarantined for ten days, during which time they receive inoculations to protect against smallpox, typhus, and cholera. (Typhoid not mentioned.—Ed.)

The hospital service is excellent. A few cases of typhus appeared at Cassel, but were promptly and successfully treated and none further have appeared. Some cases of pneumonia have occurred, especially amongst the French.

The food is very similar in all the camps, and a well-balanced scientific ration is provided. A sample menu for a day is: bread, 10 ounces; potatoes, 1 lb. 4 ounces; pork, 3½ ounces; vegetables, 1¼ ounces; oleomargarine, ⅛ ounce; preserves, 3¼ ounces; at a cost of about 15 cents. This gives about 2899 calories; the average of the rations issued in all the camps being about 2700 calories. The bread is the only component issued in solid form; and all the rest is served in a thick soup, necessitating only a metal plate and a spoon as tableware. The prisoners do all the cooking, kitchen police, and other work connected with the messing. Tobacco and other articles of necessity and luxury are bought from the canteens and paid for by the prisoners from their small earnings.

The barracks are grouped by battalions, and each group is surrounded by a high wire fence and has a separate commandant and administration. There is plenty of free air space for the health and comfort of the prisoners.

All kinds of games and sports, consistent with discipline, are permitted; and few complaints are registered, though occasionally the English prisoners find fault with the amount of food issued.

The treatment otherwise of the prisoners is good. The French seem to be in favor, due probably to their good humor, industry, and amenability to the discipline of captivity. The Russians are also admired for their discipline and spirit of resignation. Religious scruples are observed, political differences are avoided, and, in general, everything is done to promote harmony.

[Notes of the War. *Army & Navy Jour.*, Aug. 7, '15. 200 words.]

The German War Ministry gave out Aug 2 the following statistics:

Germany and Austria occupy enemy territory 18,125 sq. mi. in Belgium, 13,125 sq. mi. in France, 81,250 sq. mi. in Russia, and 6250 sq. mi. in French Alsace,—total 118,750 sq. mi. The total of prisoners, 1,695,412, of whch 8790 officers and 1,330,000 are Russian.

To June 15, 5843 field guns and 1556 machine guns had been received at collection stations. The general estimate of guns captured is 8000 field pieces and 3000 rapid firers.

[Science in German Concentration Camps. By Dr. Alfred Grademvitz. *Scientific American*, July 3, '15. 1000 words. Photos.]

The remarkable medley of nations represented in the prisoners' camps in Germany has made sanitation of prime importance. Filth and vermin spread disease, and not only humanitarian reasons, but motives of self-preservation, require enforced hygiene.

The first step taken is to clean the bodies and clothes of the prisoners. One process is

EUROPEAN WAR—Continued

to place the men in groups of fifty in one room, require them to strip, give them a shower bath, and disinfect their clothes in live steam for 20 minutes; and also, if necessary, cut their hair.

Each barrack houses 200 to 300 men, has its own washhouse where clothing is laundered; and everyone is required to take plenty of outdoor exercise. Military drill and gymnastics under the direction of the men's own superiors are required regularly.

Great care is taken with the sick, and in this the German doctors are assisted by foreign medical men under detention. Newspapers are published and amusements afforded, to keep the prisoners mentally healthy.

—Railroads, Use of in

See also

RAILROADS—STRATEGIC

—Raw Materials of War—Cotton

See

COTTON

—Relations With United States

[What May Happen if Germany Does Not Offer Satisfactory Assurances. *Arms & the Man*, June 10, '15. 800 words.]

The "Navy" is quoted as saying that the strength of our Army would not admit of foreign services, whereas our Navy might do good work in relieving foreign patrols off our coast and the British patrol on North Atlantic steamer lanes. Our destroyers would be useful in patrolling the English coast, and the heavier units in the Adriatic and the Mediterranean.

Short of war, diplomatic relations might be severed, and by special act of Congress, German merchant vessels within the U. S. seized and held. But this would be a measure of doubtful justification, and of no value from a military point of view. Our contention with Germany, moreover, involves a matter of national conscience, not to be solved by mere formal or commercial reprisals.

—Reports of Atrocities

[The Bryce Report on German Atrocities *Literary Digest*, May 29, '15. 2500 words.]

[Quotation from the report, with running commentary, and press opinions. Many papers look upon the report not as a verdict, but as a partisan statement. Herman Ridder in the *Staats-Zeitung* dismisses the report as "a rehash of stories long since twice told and long ago disproved." Some papers point out that the report, if true, damns, not the German people, but German militarism—The Kaiser, the Crown Prince, the High Admiral, the General Staff, and the Army Commanders are pointed out as the real criminals.]

—Rifle in

See

INFANTRY—ARMS—RIFLE—USED IN EUROPEAN WAR

—Sanitary Service

[Military Sanitation in the Present War. By Dr. Alfred Gradenwitz. *Scientific American*, May 15, '15. 2000 words.]

(Describes the Exposition of Military Sanitation in Berlin. Explains care of wounded on board ship. Discusses sanitary appliances and methods with the armies in the field.)

See also

SURGERY, MILITARY—IN EUROPEAN WAR

France

[Defective Administration of the Service for French Wounded. Editorial. *British Medical Journal*, Aug. 21, '15. 600 words.]

A near political crisis in France was raised by a discussion by M. Peyroux on Aug. 13. All sorts of charges were made against the Medical Department of the army: untrained men were used when trained men were available. wounded sent to points where there were no preparations made to receive them, etc. Mentions an article in *Le Journal* by M. Andre Maginot analyzing the defects in the French system.

Germany

[Health of the German Army—Medical Experiences. Quoted from *Manchester Guardian Jour. Royal Army Medical Corps*, April, '15. 1100 words.]

Twenty-five hospitals were established in Berlin the first few weeks of the war, with accommodation for half an army corps. The transport of wounded is said to have been badly managed at first, with much suffering for the sick and wounded, due largely to the pressure to get troops to the front. The efficiency of the Army Medical Corps has been obtained at the cost of the civil population, many country districts having no medical aid as a result.

Great Britain

[Sanitation in War. Major R. B. Answorth, R.A.M.C. *Jour. Royal Army Medical Corps*, April, '15. 2000 words.]

Mentions the fact that this is the first campaign in which sanitary officers and sections have been employed with a British Army in the field; that it has been found necessary to increase the number employed; recalls the experience in South Africa, and says that if that experience were repeated it would give 30,000 cases of typhoid; that such an epidemic would break down the present hospital organization; and that it would result in a Royal Commission of inquiry. Invites attention to the necessity of attention to detail and unity of action on the part of the medical officers; the great necessity of anti-typhoid inoculation; speaks of one medical unit in which less than one-half were protected; speaks of the necessity of convincing commanding officers of the necessity of sanitary precautions, and some of the trials of a sanitary officer with these gentlemen.

[Transport of Wounded from Gallipoli. By Capt. L. B. Cane, R.A.M.C. *St. Bartholomew's Hospital Jour.*, Aug., '15. 1000 words. 3 illus.]

Twenty thousand wounded were carried back to Alexandria in 3 weeks, and hundreds still arrive daily. Many were shot before reaching shore, and some of the boats became so full of wounded that they returned to the ships without landing. Transports with 800, 1100, and one with 1618 wounded men had

only three medical officers to do the work for the two days and a half required for the trip. Refers to the difficulties which had to be met in disembarking these wounded. The rolls given the medical officers were incomplete. The wounded had to drag themselves two miles to the dressing station and then be transferred through shallow water to the boats.

[Medical Arrangements of the British Expeditionary Force. Special Correspondent in Northern France. *British Medical Journal,* Aug. 21, '15. 2000 words.]

Mobile laboratories, used at the front to maintain the health of the command. Activities covered, typhoid fever, the effect of inoculation of living b. typhosus, diagnosis of cerebro-spinal meningitis, watching contacts, the use of annoted maps to watch potable waters behind the Allied line, a second set of maps related to typhoid cases, etc. The results have been to keep down disease in a satisfactory manner.

[The War in Europe. *Army & Navy Jour.,* Oct. 9, '15. 150 words.]

The number of British medical men on whole-time war service is 5265; 1516 additional men have offered for service. There are approximately 6555 medical men of military age in England, Wales and Ireland who have not yet offered.

Many medical students abandoned their studies and joined the combatant ranks. The need of medical officers is so great that those near the completion of their studies have been asked to return to school and thus make themselves available for duty in their professional capacity.

Russia

[With the Medical Service of the Russian Army. *Sphere,* July 3, '15. 700 words. Illus.].

The Russian medical service, defective in the Russo-Japanese war, has since been reorganized and greatly improved. Each regiment has a medical establishment, of less strength, however, than in most armies. Each large unit of the mobile army has its own hospital, with beds for 10 per cent of the strength of the command. There are large base hospitals at the more important military stations in Russia, taken over in time of war by the Red Cross. A certain number of beds in all local hospitals are reserved for officers and soldiers.

The Red Cross has trained reservists as dressers, hospital orderlies, and stretcher-bearers. On mobilization, each regimental establishment was nearly doubled by the addition of 18 beds and 36 stretcher-bearers. With encouragement from the royal family, the Red Cross has developed into a very large organization. Funds for its maintenance are raised mainly by popular subscription, and Red Cross workers are found not only in the base hospitals, but also at the front. Among these are a certain number of women nurses.

Medical bases provide the necessaries for the mobile and stationary field hospitals. In rear of these the motor ambulances work. Then come narrow-gauge railways to rail head, and then finely equipped hospital trains to convey serious cases to hospitals situated all over Russia.

—Submarines in

See

SUBMARINES—USE OF IN EUROPEAN WAR

—Surgical Experience in

See

SURGERY, MILITARY—IN EUROPEAN WAR

—Topography of

[Geographic Aspects of the War. By Prof. D. W. Johnson, Columbia University. *Bull. of the Amer. Geographic Soc.,* Mar. and Apr., '15. 7000 words. Geologic. maps.]

I.—THE WESTERN THEATER OF WAR

The so-called "Paris Basin" was formed geologically by a deposit of clay, sandstone, chalk, and limestone on a flat plain, and the edges of this plain were afterwards warped upwards, forming, on its eastern side, the Vosges and Ardennes mountains. Erosion from this eastern edge has formed a succession of steep scarps facing the Rhine valley, while the western slope of the mountains remains gentle and gradual. This makes the movement of troops from the Rhine country into France difficult if opposed by a resolute enemy. In the south these scarps coincide with the French frontier, and the French troops, to invade Alsace, moved downhill; while towards Lorraine they fought uphill in making the invasion.

Press reports state that the German commander at Mülhausen, after repeated attempts and failures to cross into France, received peremptory orders to cross, and it being impossible, so reported and then committed suicide.

Here it may be noted that, should the French cross the Rhine through Alsace for an invasion of Germany, they would encounter precisely the difficulties that their enemy now finds.

Not far south of Mülhausen the only feasible pass in the Vosges is defended by the great fortress of Belfort.

North and west of the Vosges the country is less broken, with scarps far less steep, and cut by the Moselle and the Meuse. Here are practicable avenues of advance for the Germans.

During the battle of the Marne, the German center near Sézanne is said to have been subjected to a disastrous fire from French batteries along the first line of cliffs east of Paris; and for months the French field army has held the Germans northeast and east of Verdun, along the line of cliffs.

Further to the north and west the French forts are located on the lines of communication fixed by the breaks in the escarpments. A large part of the places named in the press reports during the retreat to the Marne are strategic points guarding these important openings.

In Belgium these heights disappear, and the plain becomes so low along some parts of the coast that only dikes hold back the sea; and this condition aided the defenders by enabling them, easily to flood the lowlands. But where the sea could not reach, the level plain, covered with a network of good roads, made excellent

EUROPEAN WAR—Continued

country for maneuvering large masses of troops.

In light of these topographical features, it is interesting to note the breach by Germany of Belgium's neutrality. She could concentrate her forces in the southern part of the broad valley of the middle Rhine and thence ascend the steep eastern face of the Vosges, or pass around their northern end across the broken upland of Lorraine or around their southern end through the narrow gateway guarded by the fortifications of Belfort. Having passed the first obstructions, the invading armies would then have to scale in succession one line of east-facing cliffs after another, under artillery fire at each cliff. The numerous delays by these routes precluded a dashing attack on Paris. Likewise the advance through Luxemburg, and up the Moselle through Metz was subject to the same obstacles, though in less degree. The remaining routes lay through Belgium. Thus it is highly significant that the main invasion was by the most roundabout but topographically the most favorable route. The German general staff had to balance the difficulties of the invasion across the eastern frontier against the longer route plus the Belgian army and violation of treaty rights, and chose the latter alternative.

II.—THE EASTERN THEATER OF WAR

Only a rectangular area, consisting of East Prussia, Poland, and Galicia, including the Carpathian Mountains, need be considered.

The Carpathians curve eastward and southeast in a great arc. In the middle part of their course they consist of a belt of maturely dissected folded mountains, sixty miles wide, with long parallel ridges and valleys, particularly along the northeastern side. No rivers cut across this portion, but there are half a dozen fairly accessible passes, of 1200 to 2000 feet elevation, permitting lines of communication. On the plain northwest are several cities of great strategic importance. Numerous streams have their sources on the northeastern slopes, uniting in the Vistula, the Bug, and the Dniester. These streams break the surface and make a difficult country. The mountains are well forested.

The rocks which are strongly folded in the Carpathians flatten out suddenly to the north and northeast and form the plains of Galicia and Poland, but retaining a dip towards the mountains. Strategic railways cross through Przemysl and Lemberg, where sharp breaks in the strata form scarps easily fortified.

The larger rivers, carrying silt and mud from the upper slopes, are subject to floods and are impassible in most places. Some are navigable and can be used as lines of communication.

This plain has been glaciated nearly as far south as Lemberg, and a mantle of glacial till covers much of the area, greatly changing the preglacial drainage. In East Prussia a broad belt of terminal moraine forms an important departure from the level plain topography. This morainic ridge trends southeast just north of the Poland border, reaching an altitude of 500 to 1000 feet, and holds an intricate network of marshes and lakes, which culminate towards the east in the Mazurian lake district. Much of this country is wild, with uncultivated areas of barren sand alternating with swamps and forest.

[The author then discusses the plans of campaign from the topographical viewpoint.—Ed.]

—Women in

[Women as Warriors. *Arms and the Man*, Jl. 1, '15. 500 words.]

It seems that in Russia there are no fewer than 400 women bearing arms. Some of these have performed remarkable services, and fifty or more have been killed or wounded.

—Wounded

The French government has issued some remarkable figures showing the percentage of wounded men who have recovered, or are recovering, and are, or will be, fit again for service. The figures are taken up to Dec 1:

Wounded, but fit for almost immediate return to the front	54.50 per cent
Wounded, and on leave	24.50 per cent
Wounded, and still in hospital	17.40 per cent
Permanently disabled and unfit for further service.........	1.46 per cent
Wounded, and died from wounds	3.48 per cent

The enormous proportion of complete recoveries testifies to the "humaneness" of the modern bullet and to the great skill of the surgeons. Casualties nowadays are chiefly temporary casualties.

[*Information*, July '15.]

More than 80 per cent of the heavy casualties are being caused by shells and shrapnel. Surgeon-General B—— of the army corps which had borne the brunt of the French offensive gave, June 23, the following figures as the result of a statistical study of a single batch of wounded. Seventy per cent of the men were wounded by shells, 5 per cent were crushed when trenches were blown up, and 14 per cent were hit by bullets. Only half of 1 per cent were suffering from bayonet wounds, and 3½ per cent were wounded by hand grenades and all other causes.

[*Army & Navy Jour.*, July 24, '15.]

In a report from one of the military hospitals we observe some interesting indications as to relative values of various weapons. Among these (British) wounded fifty-two per cent suffered from gunshot wounds and forty per cent were struck by shrapnel. Six-tenths of one per cent showed bayonet wounds.

France

[Paris Letter. *Jour. Amer. Medical Assn.*, July 24, '15.]

In the Paris letter of July 1st, 1915, the following subjects are interestingly touched upon:

(1) Reduction of the Hospital Period in cases of soldiers afflicted with chronic or relapsing conditions;

(2) Employment of war cripples.

The reduction of the hospital period is rec-

ommended to curtail expense to the Government. Chronic conditions which do not require immediate attention, do not always incapacitate men from the auxiliary service at least. Others may be affected with persistent or relapsing conditions which are serious enough to disqualify them for regular service, and which do not improve rapidly and permanently under treatment. These should be furloughed or discharged. The circular specifies a number of skin diseases that come within the above category and recommends the employment of certain remedies to prevent the reappearance of contagious diseases which would necessitate patients being sent to hospital.

For the employment of war cripples who are compelled to change their occupations, the administration has addressed a letter to associations of employers, and heads of industries, containing a list of questions to ascertain (1) the possibility of the cripple pursuing his former occupation to a greater or less extent; (2) when this is impossible, to suggest occupations whereby partial or complete livelihood can be gained. Certain important mutilations are specified: loss of an eye, an arm, leg, etc. It is intended on the information obtained to take measures to construct workshops for training cripples.

Great Britain

[How British Wounded Are Cared For. *Army & Navy Jour.*, Aug. 21, '15 500 words.]

In a quotation (source not stated) the care of British wounded rests on two principles,—the maintenance of mobility by disposing of the non-effective, and the rapid removal of the sick and wounded to places where they can receive proper medical and surgical treatment. This must be done without interference with supply, a task demanding a high degree of perfection in organization. The disabled must be sorted into classes, and the necessity of moving serious cases must take due cognizance of the danger to life of such movement. A partial solution is found in water transport.

EXPLOSIVES

[Notes upon explosives. Nitrate aniline compounds. José Rojas Feigenspán, Captain Professor of the Artillery Academy. *Memorial de Artill.*, Madrid, May, '15. 6600 words. Formulas, figures, and tables.]

(A technical discussion of the explosive, impossible to condense.)

[Powders and Modern Explosives. By Eduardo Pellen, Major of Artillery. *Revista de Artilharia*, July, '15. 5600 words.]

The methods of manufacture, handling, storing, and caring for powders and explosives of different kinds are given in the full text, to which reference must be made for these methods.

This is a continued article and deals in this number with nitroglycerine, nitrocellulose, the French powers AM, B, and D, cordite, ballistite, etc.; also French and German powders for use on battle ships. The methods employed in different countries of treating these powders is given in detail.

The causes and prevention of decomposition are given. The methods and materials employed by the United States in the manufacture of the powders used in the services are shown in detail.

The next article will deal with "Curved Fire of Naval Artillery"

[Modern Powders and Explosives. By Eduardo Pellen, Major of Artillery. *Revista de Artilharia*, Aug., '15. 2000 words.]

This is a continuation of a discussion of powders and explosives, considering this month "conservation" and means employed to determine the condition of powders. The following experiments are given: (reference to the text must be made for the explanation of these experiments): experiment of Abel, experiment of Guttman, the German, the Krupp, the Silvered Vessel, de Sy, the French, and the Gergman-Yunk experiments.

[Powders and Modern Explosives. By Eduardo Pellen, Major of Artillery. *Revista de Artilharia*, Sept., '15. 2700 words.]

(The conclusion of a technical discussion of powders and explosives, for which reference must be made to the text.)

See also
EUROPEAN WAR
(Article: "Scientific and Engineering Aspects of the War.")
POWDER

—Tetronitromethylaniline, Pentanitrodimethylaniline, and Tetronitroaniline

[Notes on Explosives—Tetronitromethylaniline, Pentanitrodimethylaniline, and Tetronitroaniline. By Capt. J. R. Feigenspán, Professor at the Artillery Academy. *Memorial de Artilleria*, May, '15. 12,000 words. Diagr. and tables.]

For brevity it is proposed to denote pentanitrodimethylaniline by the name *pentralite* and tetranitromethylaniline by the name *tetralite*.

Methylaniline, dimethylaniline and metanitroaniline, the basic materials from which the above explosives are obtained, are derived from aniline, $C_6H_5NH_2$.

Both industrially and in the laboratory aniline is obtained from benzene.

Metanitroaniline is the substance from which tetranitroaniline or, as we shall call it, *tetraline*, is formed.

Tetralite, $C_6H_2(NO_2)_4NCH_3$, is prepared by dissolving one part, by weight, of methylaniline in ten of concentrated sulphuric acid. After cooling, this solution is run into a vessel containing five parts of concentrated nitric acid, the temperature being maintained between 30° and 40°.

After centrifuging, washing with water, stabilizing and drying there should be no acid reaction with test paper and the melting point should be between 125° and 128°.

Pentralite, $C_6N(CH_3)_2(NO_2)_5$, cannot be

EXPLOSIVES—Continued

obtained by the direct nitration of dimethylaniline on account of the violence of the reaction. The dimethylaniline is first sulphonated. The sulpho-dimethylaniline is poured into nitric acid which has been previously heated to 120°. Pentanitrodimethylaniline is produced with the regeneration of the sulphuric acid.

Melted tetralite is viscous, pentralite more fluid.

Tetraline is a new explosive recently discovered in England by Flürschein. It is precipitated in crystals when metanitroaniline is acted upon by a mixture of sulphuric and nitric acids. It is yellow in color, with a density of 1.87 and melts at approximately 215°. At ordinary temperatures it is insoluble in water and very slightly hygroscopic.

The computed heats of formation and the reaction equations of these explosives are:

Tetralite, +32.6 Calories,

$C_6H_2(NO_2)_4NCH_3 = 0.5CO_2 + 6.5CO + 0.5H_2O + 2H_2 + 2.5N_2$;

Pentralite, +41.6 Calories,

$C_6(NO_2)_5N(CH_3)_2 = CO_2 + 7\ CO + H_2O + 2H_2 + 3N_2$;

Tetraline, +24.8 Calories,

$C_6H(NO_2)_4NH_2 = CO_2 + 5\ CO + H_2O + 0.5H_2 + 2.5N_2$.

In addition to the usual thermochemical quantities, the velocity of propagation of the explosive wave is computed from the formula $V = 10 \sqrt{R \frac{P}{\Delta(1-d)\Delta}}$ m. per sec., where $R = \frac{Q_{\kappa\nu}}{Q_{\kappa\rho}}$, P is the specific pressure, and Δ and d have their usual significance. The duration of the explosion is computed from the formula $De = \frac{1}{1.61V\sqrt{\Delta}}$ sec. and the power of the explosion from the formula, $P = \frac{W}{D}$ kgm. per sec. where W is the potential energy of the explosive in kgm.

The heat of explosion of one kilogram, $Q_{\kappa\nu}$ the absolute temperature of explosion, T, the force of the explosion, f, the potential energy of one kilogram, W, and the potential, P (for $\Delta = 1$) are computed as follows:

Tetralite—$Q_{\kappa\nu} = 767.08$ Calories, T=2695°, f =9514 kg. per sq. cm., W=326009 kgm., P=8,150,225 kgm. per sec.

Pentralite—$Q_{\kappa\nu} = 871.72$ Calories, T=2918°, f=9968 kg. per sq. cm. W=370481 kgm., P=7,409,620 kgm. per sec.

Tetraline—$Q_{\kappa\nu} = 966.85$ Calories, T=3246°, f=10039 kg. per sq. cm., W=410912 kgm., P=4109120 kgm. per sec.

For $\Delta = 0.5$ pentralite gives more pressure than tetralite, for $\Delta = 1$ the opposite is true. Each will give the same pressure for $\Delta = 0.64$.

The rupturing effect of tetralite should be greater than that of petralite or that of tetraline for high densities of loading such as would be used in practice. Similarly petralite should be superior to tetraline.

FALKLAND ISLANDS, Naval engagement at

—Artillery Armament

[Artillery Armament of the German and English Vessels in the Naval Battle on the South American Coast. Editorial. *Artill. Monatshefte*. Jan., 1915.]

The total muzzle energy of the German vessels was 116,532 m.t.; of the English vessels, 371,632 m.t. But since all guns less than 15 cm. caliber were unable to produce any fire effect, these amounts are reduced to 91,768 m.t. for the Germans and 321,540 m.t. for the English. In the decisive battle, the English thus had all seven ships, the Germans only two, or a three-to-one superiority. In the naval battle off Coronel the opposing sides were about equal in strength.

FENCING

See also

Gymnastics, Military

FESSENDEN OSCILLATOR

[A Method of Shore-Tug Signalling, Making Use of Sound Waves Propagated Under water. By 2d Lieut. S. M. Decker, Coast Artillery Corps, U. S. Army. *Jour. U. S. Artill.*, Mar.-Apr., '15. 2500 words. Illus.]

Three practicable methods can be used in shore-tug signalling:

1. Visual signalling.
2. Radiotelegraphy.
3. Submarine signalling.

In special cases, for short distances, sound signals in air can be used.

Water has many advantages over air for purposes of signalling:

1. It is free from the zones of silence which occur when signals are produced in air.
2. Absorption of sound is less in water than in air, the signal is more reliable, and the range is greater.
3. The sound is unaffected by wind.
4. The sound is not affected by atmospheric disturbances.
5. The direction of the sender can be determined accurately.

The oscillator for propagating sound under water invented by Professor Reginald Fessenden is fully described, and a table gives the results of a series of tests of the efficiency and range of the apparatus. (For description and tests reference should be had to the complete article.)

The oscillator may be used to send and receive either telegraphic or telephonic signals. In its present state of development it is thought a telephonic range of five miles is possible; while the table indicates that telegraphic signals were received frequently up to distances of twenty miles.

FIELD ARTILLERY

[*Note, for a rapid survey of the material under* Field Artillery, *that it is distributed on the pages indicated under the following geographical and subject subheads:*

[*Note also for much other valuable material on* FIELD ARTILLERY *the cross-references, not only after the General material under this head, but also after the material under many of the* FIELD ARTILLERY *subheads.*]

[Letter from a Red Leg. *Arms and the Man,* June 24, July 1, July 8, '15. 3000-4000 words each issue.]

[The author describes in a series of familiar letters his experiences as a private in a militia field battery. His purpose, under the form selected, is really to instruct his readers in field artillery matters, and naturally he addresses himself to them under the assumption that they know nothing about the subject, and require to have the most elementary matters explained to them.]

See also
FUSE SETTER

Germany

[The Principles Governing the Use of the Prussian and German Field Artillery, 1813-14, 1870-71 and 1914-15. Editorial. *Artill. Monatshefte.,* Mar, '15. 6500 words.]

Organization, equipment and training moulded together by *esprit* form the foundation for efficiency in an army. An indomitable spirit can exist only where all citizens are subject to military service. After the downfall in 1806, the German people were oppressed and cowed by defeat and had lost confidence in their army which confidence was restored by the introduction of universal service, more humane methods in providing for the welfare of the men, and by a patriotic impulse to rebel against the dictatorship of Napoleon.

In the artillery, promotion was slow and the technical character of the service offered little inducement to officers. In 1870-71 the circumstances were different. The wars of 1864 and 1866, the increase in the field artillery and the resulting impetus given to promotion had rejuvenated the corps of officers and raised their enthusiasm. The fears expressed in recent years that social democracy had undermined the government and made our young men more effeminate have proven groundless. No other war has so tested the resources of a nation and its ability to make heroic sacrifices.

The efficiency of an army depends in great part upon organization. In times of peace an adequate reserve in units, men, and ammunition must be provided. In 1808, the Prussian field artillery was very deficient. By the Treaty of Paris, Napoleon fixed its maximum strength at 6000. In 1809, the field artillery was organized into 45 units of 133 men each. These were organized into 3 brigades each composed of 3 horse, 11 foot batteries and ordnance company. Due to the reserve system inaugurated by Scharnhorst there were in 1812 about 4350 trained artillerymen in reserve. These were organized into 44 provisional batteries. By impressing train soldiers and civilian teamsters to act as drivers, the actual strength was increased to 16,000 as compared to 6000, the number actually fixed by treaty. For the war in 1813-14, 34 batteries were mobilized, 15 additional batteries were mobilized during the suspension of hostilities. There was a great deficiency in draft animals. It took a long time to train these green horses and their inexperienced drivers. Not until 1815 was field artillery assigned to higher commands. Commanding

FIELD ARTILLERY—Continued

Generals were quite ignorant of its use, the actual artillery command being vested in a field artillery officer. In most cases lieutenants commanded batteries, because of the great deficiency in officers.

In 1870, the field artillery had a strong organization under an inspector general and was assigned in proper proportion to army Corps. The discretionary powers of the field artillery commanders were still very great. Although most batteries were short of their necessary strength, mobilization was completed in ten days. The Franco-German War showed the great advantages resulting from a rapid mobilization, a fact again proven by the present war. In recent years the strength of batteries has been appreciably increased so that there is very little difference between their peace and war strengths.

The materiel used by the field artillery during the Napoleonic Wars dated from the reign of Frederick the Great and was very inferior to that of the French. Carriages were cumbersome, axles were made of wood and took fire on the march, limber and powder chests were leaky. Lack of funds made improvement impossible. Light and horse batteries had six 6-pounder guns and two 7-pounder howitzers. The foot batteries had six 12-pounder guns and two 10-pounder howitzers. The maximum ranges of the guns were 3500 and 4000 paces; of the howitzers, 2500 and 2900 paces. On account of the great variations in the size of the projectiles and the ballistic properties of the powder charges, their fire was very inaccurate. The battle range for shell fire was 1600 paces; for canister it was between 600 and 800 paces. At the beginning of the war only 1235 rounds per battery were carried; this was increased later on to 200 rounds per gun. The ammunition supply was always inadequate. Harness was poor, in many cases improvised. Little attention was paid to shoeing and no forges were taken into the field. As a result, horses went lame and the mobility of the batteries suffered greatly.

The field artillery went into the war of 1870 with rifled, breech loading guns of 8-cm and 9-cm caliber, far superior both in accuracy and range to the French guns. Shell was the principal projectile and the ammunition supply was found adequate for most battles. The battle ranges were between 1200 and 1900 meters and fair results could be expected at ranges from 2200 and 3000 m. The characteristic features of its employment were early appearance in action, massed fire from mass formations and a keen offensive spirit. The Emperor Napoleon considered the German Field Artillery the decisive arm of the war.

In recent years the long recoil, quick firing gun with all the attendant improvements in fire control has been introduced in Germany as in every other country. The increased range, size of the danger area, and rapidity of fire of modern field artillery have also increased the need for more cover. These things in turn have brought about the development of the howitzer and field mortar.

Up to 1812 all instruction was imparted and transmitted by word of mouth and every commanding officer carried out his own ideas. Scharnhorst in his comprehensive scheme of reorganization realized the importance of systematic training and instruction based upon established principles. The first regulations were very simple in their prescriptions. For battle, troops were usually arranged in a normal order. The light and horse batteries were held in reserve until the decisive moment for action. The tactics of the artillery being simple, great latitude could be permitted its commanders. Lack of horses and lack of field training and maneuvers proved a great disadvantage. Firing practice was very much neglected and there were no rules of fire. Each battery was allowed 24 rounds for practice.

Just prior to the Franco-German war, wonderful progress was made under the Inspector General, General v. Hindersin. A school of fire was established in 1867 and new regulations promulgated. Great stress was laid upon tactical and field training of the officers and men.

In recent years the field artillery has not rested idly upon its laurels, but has paid particular attention to fire instruction and firing practice. The regulations of 1911 prescribed indirect fire and fire from masked positions as the rule. Methods were simplified and emphasis laid upon the necessity of obtaining effect as quickly as possible after a suitable adjustment had been made. Measures were also taken for the training of officers of the reserve and inactive lists in conduct of fire. In retrospect, the progress made by the field artillery as marked by these three periods, must be considered as very satisfactory, reflecting truthfully the spiritual and industrial development of the German people.

Italy

[Reorganization of Field Artillery. Current Notes on the European War. Editorial. *Artill. Monatshefte,* Apr. '15. 200 words.]

By changing from 6 to 4 gun batteries, the F.A. was increased by 36 battalions or 90 batteries. Formerly, there were 196 light and 8 horse batteries organized into 75 battalions with a total of 1224 guns. Now there will be 294 batteries or 1176 guns. The organization gives the batteries greater efficiency on account of greater mobility and increase in the ammunition supply.

[The Italian Artillery. Note. *Sphere,* June 5, '15. 200 words. Illus.]

The Italian Field Artillery has recently been partially armed with a 75-mm. gun of the Deport pattern, remarkable for its lightness compared with its shell power. It fires a 16-lb. shell, and with 20 rounds in the limber weighs barely 2900 lbs. behind the team. The recoil control is by compressed air, which gives a light carriage but has the disadvantage of a 5-ft. recoil with variable resistance. A spike

is used on the trail instead of a spade. The split trail opens to 50° in the firing position and admits an elevation up to 50°.

Russia

[Remarks on the Russian Field Artillery and Its Use. By First Lieutenant H. A. Rolsted. *Dansk Artilleri Tidsskrift,* Jan, '15. 5000 words.]

At the outbreak of the Russian-Japanese War, the Russians had just begun to re-arm their artillery with the new rapid fire pieces.

Only a small portion of the personnel was familiar with the new matériel, its peculiarities, its complicated apparatus, the new tactical methods and firing technique.

The ten years' interim between that war and the present great struggle was no doubt used to correct the faults discovered.

The decade just past has been a renaissance for the Russian Army, but the present war found the re-organization of the Russian artillery still incomplete, and the supply of heavy artillery insufficient.

So far as can be determined, the Russian artillery organizations are now distributed as follows:

The field and mountain artillery are assigned to the higher infantry units, the horse and mounted mountain artillery to the higher cavalry units, while the lights howitzers are with the army corps.

The heavy artillery is, in time of peace, with the army corps, and, in time of war, with the field armies.

All Cossack organizations have Cossack batteries.

United States

[Mobile Artillery Materiel. *Army & Navy Register,* June 12, '15. 350 words.]

The Ordnance is preparing for the production of mobile artillery materiel having greater range and power than that at present in service. A pilot 3-inch split trail is to be tested at the Hook—and the pilot 3.8 split trail howitzer has given results so good that a number are to be manufactured. Designs for 4.7 split trail guns and howitzers are in course of development; these new designs will obviate the necessity of burying the trail. A 7.6 howitzer, on a split trail mount, is now being manufactured and designs are being developed for 9.5 and 11-inch howitzers.

—Ammunition—Accidents in Transport

[Accidental Explosion of Shell. Editorial. *Field Artillery Jour.,* Jan-Mar, '15. 200 words.]

While a battery was moving at a trot over macadam roads a steel shell accidently exploded. None of the other rounds in the chest exploded but they were badly twisted and damaged. Rivets, chest door and front of chest were blown off completely. No injury or loss of life resulted.

—Ammunition—Shrapnel

See
SHRAPNEL

—Ammunition—Shrapnel vs. H. E. Shell

[Comments in *Army & Navy Jour.,* June 12, '15. 250 words.]

[Quoting from the *London Times.*] Men died in heaps upon the Anliers Ridge ten days ago because the field guns were short, and gravely short, of high explosive shell. * * * While the French authorities steadily raised the percentage of high explosive shells allotted to their field guns, our [British] gunners were expected to do the same work with shrapnel, and the percentage of high explosives sent across the channel remained, and still remains, dangerously low. Shrapnel has great and valuable uses, but for smashing up the formidable entrenchments of the enemy, it is practically useless.

—Ammunition—Supply Service

[Ammunition Service and Ammunition Supply of Field Artillery. By Capt. Trautz, 4th Baden F. A. Reg. No. 66. *Artill. Monatshefte,* Apr., '15. 4000 words. 2 tables.]

A critical study of military history is necessary in order to form correct conclusions on this subject. The recent Balkan War has not appreciably changed the importance of the Russo-Japanese War in its application to the present European War, although the figures of the Japanese General Staff on expenditure of ammunition will apply in particular cases only. At the battle of Nanshan, the Japanese attained a maximum daily expenditure per battery of 280 shell and 810 shrapnel. The Russians exceeded this Japanese maximum on several occasions. It took 40 Russian rounds as many rounds as required by the Germans in 1870.

The Japanese average daily maximum expenditure per battery was 114 shell and 377 shrapnel. In many cases these numbers were exceeded. Regiments had to help each other out with ammunition.

Tactical progress and technical improvements will necessitate an increase in the ammunition supply. Rocquerol demands 500 and Langlois 3000 rounds per gun on the field of battle. This emphasizes the importance of husbanding one's ammunition and of acquiring an adequate supply in time of peace. This may be accomplished either by introducing a unit projectile or by increasing the number of rounds. The proportion of shell to shrapnel which was at 1:4.4 for the Russo-Japanese war, has now changed considerably in favor of the shell.

The number of rounds with the firing battery may be increased by carrying one or two baskets of ammunition (6 rounds) on the gun shield or limber and by causing the limbers of the piece and caisson to be emptied or left in the firing position.

The commander of the combat train must have a good tactical understanding and training in order to anticipate the need of more ammunition. To his ingenuity should be left the manner in which the ammunition is forwarded to the firing battery. The Japanese frequently suspended a wire cable and sent the ammunition forward in baskets by trolley. Every fraction of an artillery command, no matter how small, should always be provided with an appropriate combat train.

A German Army Corps in order to equal the ammunition supply of the French, should

FIELD ARTILLERY—Continued

have ammunition columns apportioned to the artillery brigade commanders. All ammunition columns are supplied from depots at the head of the line of communications. The use of motor tractors has greatly expedited and simplified this service. As shown by Gen. Langlois, 750 motor cars can cover 60 km. and replenish the ammunition trains in 12 hrs. This operation was formerly done by 4 supply columns each composed of 3750 two-horse vehicles and required 2 to 3 days.

The Russians made efficient use of their railroads in their ammunition supply service. The Dalny-Mukden line broke down during the battle of Wafangao. The Russian Siberian railroad surpassed the expectations of the Japanese General Staff.

The present war has shown the importance of exercises in time of peace involving practice in ammunition supply.

—Ballistics—Lost Motion

[The Effect of Lost Motion on Accuracy. By 1st Lieut. R. R. Nix, C.A.C. *Field Artillery Jour.*, Jan-Mar, '15. 5000 words.]

(NOTE.—This is a mathematical and technical discussion, the full text being of interest to Field Artillerymen.)

Lost motion, amounting to 8 or 10 mils in the elevating or traversing mechanism, does not materially affect the accuracy or rapidity of fire of the 3-in. gun. Most errors, if not due to personnel, are caused by play in sights, lost motion and slipping of range discs of quadrants and improper range rings on fuse setters. If the gun squad performs its duties properly, the errors due to lost motion in the gun carriage should be relatively small. If not, the errors may be 7 mils in deflection when the breech is opened with the gun not loaded, 1 mil in elevation due to loading and 1 mil in deflection due to the operation of closing the breech with the gun loaded. The operation of pulling down the firing handle will cause no error if the range is under 1500 or over 3000 yards since the preponderance of weight of the muzzle or of the breech, as the case may be, will make any derangement impossible unless unusual force is applied. Between 1500 and 3000 yards the error varies between 0 and 3 mils, maximum at 2000 yards. This pull will cause no error in deflection. Use of the lanyard will cause no errors either in elevation or deflection. To determine whether there is any derangement due to recoil before the projectile leaves the bore, a theoretical investigation is of interest because it predicts what actually occurred later at the Proving Grounds.

$$V_g W_g = (W_p + \frac{\overline{W}}{2}) V_p \quad \text{(Equation 1)}$$

in which W and V represent the weight and velocity of the projectile and recoiling parts, and $\overline{W}$ represents the weight of the powder charge.

The amount of free recoil while the projectile is in the bore is determined by equation (1) as 1.3164 inches. To determine what distance will be passed over in retarded recoil, the approximate time during which the projectile is in the bore must be obtained from the equation $t = \frac{8U}{2V}$ in which U is 6.21 ft. or the travel; V is 1700 ft. or the muzzle velocity and t is .00548 secs. or the time. Substituting this value of t in the equation for the negative acceleration of the recoiling parts we have —.03204 in. The distance passed over in retarded recoil by the time the projectile leaves the bore is therefore 1.3164 — .03204 = 1.2844 inches or approximately 1.3 in. Now if the force producing rotation of the gun about its center of gravity and of the cradle about its pintle is sufficiently large, it may during this retarded recoil produce a measurable deviation in the flight of the projectile, and it must be determined whether all of this deviation cannot be accommodated by necessary tolerances, elasticity and flexibility of parts.

The formulae for the moments of inertia of the gun and the cradle are therefore first deduced and the equations of rotation of these parts then solved. From these equations it is determined that the jump of the projectile due to the effect of free motion of the gun may be as much as 14 minutes and the angle of rotation of the cradle about its pintle as 4.6 minutes. These motions follow each other closely so that the parts of the carriage possess sufficient elasticity to accommodate this rotation without undue strain. The rotation of the projectile in the bore affects the error in deflection very slightly, amounting to only 42.4 minutes or a displacement of .045 in. of the gun clip with reference to the cradle guides. This is determined by the equation for rotation of the gun about its longitudinal axis.

The conclusions are that lost motion in the traversing and elevating mechanisms does not materially affect the accuracy of the gun. However, in the heat of action or with untrained gun squads when duties are not properly performed, errors amounting to 3 mils in elevation and from 3 to 5 mils in deflection are possible, but to jolt the gun off the target, a force of 30 to 40 pounds must be intentionally applied.

—Defense against aircraft

[Attack and Defense Against Hostile Aircraft by Artillery in the Field. By Lieut. Col. H. DeT. Phillips, R.G.A. *Journal of the Royal Artillery*, Feb, 1915. 6500 words, 1 chart.]

Aircraft are being rapidly developed in their military possibilities, and artillery has by no means reached its limit of development.

Dirigibles show flights in distance 274 miles (1914,—since greatly increased.—ED.); in altitude above 10,000 feet (1912); and in speed about 40 miles. Aeroplane records are 627 miles, over 20,000 feet altitude, and over 125 miles per hour with aviator only. With one passenger, these figures are considerably reduced.

On messenger service, the aeroplane can fly at an altitude beyond the reach of artillery. On reconnaissance an observer must be carried, and observation requires flight at moderate speed at altitudes within reach of artillery. In clear weather aircraft can detect

troops from an altitude of 5000 to 6000 feet within a radius of 4 to 6 miles. They are practically safe from artillery fire at a height of 4500 feet or at a range of 4000 yards, and from rifle fire at 3000 feet altitude and 2000 yards range. High speed and maneuvering reduce the chances of being hit. Observation in the 1913 maneuvers was systematically carried out and effective, though on more than one occasion cavalry escaped detection, probably because of the wider range of its movements. High speed offered great difficulty in observation. Experience in the Balkan war showed that observation with the naked eye required altitudes less than 3000 feet, but that when something was found this could be supplemented by observation through glasses at higher altitudes. In close country, the observer must be either near or high to prevent screening of columns on roads by hedges.

During observation, an aeroplane will present a target not more than 5000 feet altitude with short periods at lower altitudes and short ranges, and at a speed not more than 40 miles per hour. Assuming 5000 feet altitude and 40 miles per hour, an approaching aeroplane would be within a range of 2000 to 6000 yards for 3 min. 40 sec. in approach, and a like period going, with 2 min. 40 sec. too nearly overhead to be fired at.

Only guns with high initial velocity are suitable for engaging aeroplanes. The requirements are high elevation, wide traverse, light weight, rapidity of fire, mobility, and steadiness. An efficient range finder is required.

Specially designed guns are necessary, but they should be as few in number as possible. A battery (4) for each division and one for army headquarters would suffice if the field artillery carriage is altered to admit of 50° elevation, thus making it effective against aeroplanes. To rely solely on Field Artillery against aircraft is inadvisable, as it could not be readily brought into action on the march when reconnaissance would be most active.

Against dirigibles, the attack should be made against the gas bag rather than the personnel, requiring a shell with very sensitive fuze. Incendiary shell, shrapnel with chain balls, and shrapnel with disks instead of balls are suggested. Small anti-aircraft guns must rely upon direct hits, since no time fuze can be employed. Attack by rockets might be a possibility. Aircraft may be used for reconnaissance, dispatch carrying, conveyance of troops and materials, bomb dropping, and observation of artillery fire. Reconnaissance is the principal use which affects the action of troops on the battlefield. Observation is difficult at night and impossible in fog and mist. It will usually be carried out in daylight, preferably going into the wind with the sun at the observer's back. Observers will fly lower in close country where observation is difficult. Woods have greater tactical importance on account of aerial reconnaissance.

There are many precautions necessary against aerial reconnaissance. Batteries should be kept in reserve so as to conceal their final locations. Positions of troops observed by aerial reconnaissance may have to be changed. Retirement under cover of a part of the force will be more difficult, as the character of the action will be disclosed. On account of its long range, heavy artillery is more valuable because its location does not betray its probable use. On the march, anti-aircraft guns should be distributed in the column, or between marching columns. In an engagement, they should be in rear of the other artillery positions. The best defense against aircraft is counter attack by aircraft.

The best means of identification of one's own and enemy aircraft is not yet determined. The question is somewhat analogous to that of vessels at sea. The question of the best method of ranging on aircraft requires careful consideration. The target is a fleeting one, requiring rapid change in azimuth, elevation and range. Only the simplest methods can be used. A diagram for the battery commander of a Field Battery is proposed, on which he plots the results of observation in range and azimuth, somewhat as in vessel tracking, predicts positions, makes a setback for time of flight, and fires when the aeroplane reaches the set back point. For special anti-aircraft guns, ranging would be based upon tracers, or if of the automatic type, tracers would enable them to be played as a hose.

Summary: In the present stage of development, aircraft can be attacked by guns, but development is rapid and any gun devised to meet present conditions might soon be obsolete. On the march, field artillery cannot be used against aircraft, and to be used at all must have mount permitting 45° to 50° elevation, a suitable projectile, reliable range finder, and an elaborate system of ranging. Other methods of defense against aircraft should be experimented with, but the best now available is counter attack by our own aircraft.

Tactics will be largely affected, particularly in the increased value of night movements and of cover afforded by woods. Flanking movements will be more difficult to execute.

See also
ANTI-AIRCRAFT ARTILLERY

—Drill Regulations

Russia

[Russian Field Artillery Drill Regulations, 1912. By Capt. E. T. Donnelly, 3d F. A. *Field Artillery Jour.*, Apr.-June, '15. 1600 words.]

The Russian regulations prescribe the close support of the other arms as the principal rôle of the artillery. The supreme commander of a large command appears to retain greater control over the artillery than under our regulations. The service of communication and of reconnaissance seems to be too elaborate. This may be due to the bitter lessons learned in the Russo-Japanese war. Each battery has eight signal men and four telegraph instruments. No telephones seem to be provided. Lateral observers are used tactically and as observers of fire. Positions are classified as open, semi-defiladed, and defiladed. This is a simplification which we should follow. Recognizing the difficulty of getting into position under cover, the Russians recommend that changes be made at night. They favor firing by battalions, and lay great stress on concentration of fire The

FIELD ARTILLERY—Continued

immediate commanders have no responsibilities concerning ammunition supply, but economy is enjoined. Much importance is attached to the use of artillery in connection with the reconnaissance of a hostile position, but a preliminary preparation by artillery is not favored

United States

[Field Artillery Drill Regulations. *Army and Navy Register*, Oct 9, '15. 175 words.]

A board of officers is revising the drill regulations of the field artillery. An opportunity is thus afforded for presenting to the service a manual of real value, not only in peace, but for war. Especially should the needs be kept in view of the hundreds of new batteries to be created at the beginning of any war.

—Fire—Direct vs. Indirect

[Notes on Artillery Matters. By H. B. *Schweizerische Zeitschrift*. 900 words.]

There has been a tendency of late to emphasize the use of indirect fire for field guns. This is as it should be, but the uses of direct fire should not be underestimated. The latter has really a more important bearing on the training of personnel than anything else. Habitual use of indirect positions lends a feeling of security to the battery which should not exist. Such a state of affairs is detrimental to the morale of the personnel. Direct fire is still a problem to be reckoned with.

It may be justly said that the problems involved in indirect laying are so much more intricate than those of the other method that any officer who can ably handle them can be relied upon to do equally well with the simpler problems of direct fire. However, this same rule does not apply to the gunners. It is these very simple problems of direct fire that tax the ability of the enlisted personnel. The spirit of initiative and aggressiveness can best be cultivated when both target and gun are in the open. Each exercise should be a series of rapidly succeeding surprises, if the best is to be got out of the gunners. For this purpose, of course, rather elaborate artillery ranges are necessary.

In Switzerland the terrain is such that batteries may be frequently forced to take up open or half concealed positions. It does not necessarily follow that the methods of direct fire must therefore be used, for if the target is poorly defined, it is better to assign an aiming point and proceed as in indirect laying. The B. C. with a better glass and a better understanding of tactical conditions should keep the fire control in his own hands. German Artillery officers have frequently reported that it is very difficult to distinguish friend from foe. For this reason no discretion should be allowed the gunner. In indirect laying there is no opportunity for the gun pointer to get on the wrong target.

But, as previously stated, exclusive use of indirect laying robs the battery of initiative. It puts all of the eggs in one basket. Should the B. C. with his observers be put out of action, the battery would be helpless. Of course under these conditions, the obvious thing to do is for the battery to continue to fire salvos with the last obtained data until the next in command has had an opportunity to orient himself as to the direction of fire and the extent of the front to be covered.

A feature of the German training which appeals to the author is the assignment of officers to different branches of the service during field exercises. This not only leads to better co-operation in joint maneuvers, but makes better observers of these officers. An officer, who is well versed in the other arms will submit much more intelligible reports than one who has not enjoyed the same opportunities. These officers are not assigned for command, but purely as observers of the exercises.

—Fire—Timing

[Correction of the Heights of Burst in our Batteries of Field Artillery. Germán Sanz Pelayo, Major 6th Regiment Horse Artillery. *Memorial de Artill.*, Madrid, May, '15. One figure. 4200 words.]

I

Submitted for the consideration of the Central School of Fire.

II

Atmospheric conditions; the range; the combustion of the time train. All other conditions affecting the accuracy of fire being perfect, how do atmospheric conditions affect the range and the combustion of the time train?

The range being a function of the density of the air, it varies directly with the temperature, indirectly with the barometric pressure and hygrometric conditions. A favorable wind increases, a contrary wind shortens, the range. The pressure affects it less than it does the rate of burning of the time train. The latter varies directly with the pressure and a contrary wind, indirectly with a favorable wind.

APPLICATIONS

Seasons.—The normal corrector is 50. In spring and in fall almost normal atmospheric conditions exist. Assuming a normal pressure, the range and the height of burst will be greater in summer than in winter (the density of the air is less).

Altitude.—With the normal corrector, the number of low bursts and grazes increases as the altitude does (the range increases and the rate of burning of the time train is retarded).

Temperature.—Higher temperature, longer ranges, higher bursts.

Pressure.—The temperature being constant, an increasing pressure accelerates the rate of burning of time train more than it shortens the range; hence, higher bursts; decreasing pressure, lower bursts. In winter, an increasing pressure tends to raise bursts, in summer it always does. A decreasing pressure has the opposite effect, summer or winter. In summer, at higher altitudes, frequent grazes.

Remarks.—Due to imperfections in the manufacture of propelling charges and time trains, the foregoing conclusions may prove to be frequently incorrect; hence the difficulty in harmonizing range and corrector settings. The relation between the condition of the

time train and altitude can easily be determined approximately and the normal corrector modified accordingly.

Correcting heights of burst.—(1) Change the trajectory, not the time of burning of the time train. (2) Change the latter, not the former.

With the first method, burst will occur in the same vertical, at the same distance from the target, approximately. *Rule.*—(Deduced and proven.) Change the angle of site by the number of mills it is desired to raise or lower the bursts.

The second method gives a constant trajectory and a variable burst interval. *Rule.*—Change corrector the number of divisions that the time of flight is to be changed in seconds.

Comparison.—Employing the second method, the target will be reached and effect obtained; with the first, accuracy is lost, no effect is produced.

We employ the second method.

—**Fire Control**

[Notes on Fire Control and Use of Battery Details; reprinted from The School of Fire Notes. Editorial. *Field Artillery Jour.*, Jan-Mar, '15. 5000 words. Table.]

(Note:—These notes are more or less technical and concern the fire control of Field Artillery.)

Ranging by a single piece gives incorrect bracket in about 33% of the cases and should therefore not be resorted to. For the same reason brackets based upon the observation of only one round at any critical range are also uncertain. 400- and 200-yd. brackets based upon the observation of two rounds at each critical range are very certain, but 100-yd. brackets are very uncertain. Brackets not less than 100 yds. based upon the observation of four rounds at each of the critical ranges are very certain. The uncertainty of the bracket decreases with the number of critical ranges—an argument for the range finder. Good vision and training in observation are essential.

Common errors in conducting fire may be classified under the following heads:—Poor memory; indecision; mistakes in commands; making improper, unnecessary or timid corrections in the elements of fire; incorrect sensing or failure to observe; failure to use battery detail properly; failure to reconnoiter target or sector properly; failure to use all available information; using more guns than necessary; improper bracket determined; sensing at critical ranges based upon the observations of an insufficient number of shots.

The probability of occupation by a target of different 25-yd. zones in a 100-, 200- or 400-yd. bracket based upon the observation of one, two and four shots at each range of the bracket and with a zero and a two mil height of burst is given in tabular form.

The method of using the battery detail must be sufficiently flexible to meet all circumstances, but in training it is advisable to adopt a "model method." The first sergeant should accompany the detail. The instrument sergeant is responsible that the route is clearly marked. Having arrived at the position, the instrument sergeant, range finder and scout No. 2 dismount and report to the battery commanded who gives them the following information:—the situation; sector for observation or fire; reference point and target if known; general location of the battalion commander's station; approximate position of the guns; aiming point and the kind of communications. The instrument sergeant and the range finder proceed with their duties and Scout No. 2 reconnoiters the sector assigned and makes a panoramic sketch. The battery commander then proceeds to reconnoiter the gun position and is accompanied by the rest of the detail, the telephone corporal conducting the led horses. Scout No. 1 and Operator No. 1 dismount and mark the line of guns and establish the station at the battery. To them is communicated the aiming point and the kind of communication. Their horses are turned over to Operator No. 2 who, with the telephone corporal, proceeds to place all led horses under cover after having obtained from the battery commander information concerning the kind of communications to be established. The telephone corporal and Operator No. 2 then lay the line and establish the B. C. station. In the mean time the battery commander proceeds with the 1st Sergeant and reconmunicates to him also the aiming point, the noiters the position for the limbers and comgait for the battery in approaching the position and the necessary instructions in advancing to and occupying the position. The first sergeant hastens to the executive with the battery and transmits this information. The battery commander then returns to his station, turns his horse over to his orderly who then goes to the position of the led horses and takes charge of them. In all these duties it must be remembered that results can only be obtained by team work.

[Battery Commander's Telescope, Model 1913. Editorial. *Field Artillery Jour.*, Apr.-June, '15. 1800 words. 2 illus.]

This instrument is of the scissors observing telescope type, mounted on a collapsible tripod by a ball-and-socket leveling mechanism. In connection with the telescope there are the mechanisms for measuring horizontal and vertical angles and the angle of site mechanism. The unit of measure is the mil. The optical characteristics of the instrument are: Power, $10 \pm 2\frac{1}{2}\%$; Field of view, $4° 15'$. The field is flat, free of chromatic or spherical aberration or distortion. Before being accepted each instrument is subjected to a severe test for water tight condition and temperature. This instrument will replace the old B. C. telescope.

[Gun Laying by Means of a Map and a Protractor. By Lieut. Gwalter, *Schweizerische Zeitschrift*, May, '15. 1200 words. 1 fig.]

For this purpose, a semicircular celluloid protractor is used. The periphery is graduated in units instead of degrees, 50 mils being

FIELD ARTILLERY—Continued

the least graduation shown. Concentric rings are scribed from the center, showing the range for every 500 meters. This means, of course, a different range graduation for every scale of map. The scale apparently used in the Swiss service is 1:100,000. A deep line is drawn radially through the 1400 mil graduation and marked "true North." Why this line is not taken through the 1600 mil mark and thus made normal to the base is not indicated in the description.

The usual means of application is to place the center mark over the battery location, orient the "true North" line and take off the azimuth and range of the target. As the B.C. instrument used appears to have an azimuth scale as well as a compass, the solution of the problem is apparent. Several hypothetical situations are worked out for varying conditions of visibility of target, aiming point, and observation point.

The "true North" line need not necessarily be set toward the north, but can be laid to the south. It must be laid, of course, parallel to a meridian. In the latter case, 3200 will naturally be added to the azimuth read off the protractor.

[Time Element. Field Artillery Firing. By School of Fire. *Field Artillery Jour.*, Apr-June, '15. 500 words.]

From statistical data on time intervals, the following conclusions are drawn at the School of Fire:

B.C. must be close to his battery; manipulation of the fuse setter must be facilitated by better scales; officers must be trained to make rapid decisions; letter code must be adopted to speed up communications; commands must be given in proper order.

—Fire Control—Aeronautic

[Aeroplanes for Field Artillery and Fire Control from Aeroplanes. Editorial. *Field Artillery Jour.*, Jan-Mar, '15. 200 words.]

Field Artillery fire control from aeroplanes can be classified as obtained by wireless telegraphy, by aid of smoke bombs and by visual signals. The English use wireless telegraphy; the Germans the smoke bomb which is dropped by the aeronaut when over the target, the observer at the battery spotting this smoke with his deflection and range measuring instruments. The French use visual signals which are not satisfactory.

[Co-operation of the Aeroplane in the Regulation of Artillery Fire. By Colonel Ricardo Solá, Argentine Army. *Rev. Militar* (Argentine), May, '15. 2500 words. Sketch and model forms.]

The French regulations for the employment of aeroplanes as an aid to artillery fire are based upon the following general principles:

"The difficulties of observations at the long ranges and the danger to the aeroplane at the shorter ranger makes its employment in these cases of doubtful value, and its greatest use will be at the mid ranges.

"Fruitful results can only be expected when the observers have had great experience in aerial observation and in the service of artillery, and when the prescribed rules of co-operation are rigorously followed.

"Only one machine should be employed with a group of batteries, and this should be assigned to a particular battery for necessary instructions and arrangement of signals.

"In long lines of artillery when several aeroplanes are observing at the same time, the selected batteries should not be close together."

Under favorable atmospheric conditions, such as obtain in Argentine, there should be no difficulty in making good observations up to 7000 m. and even beyond, and the assistance of the aeroplane would be needed more at these distances than at the mid ranges. As to the short ranges, it is thought that the observation might be made with reasonable security from a position *behind* the lines.

Procedure:

After bracketing the target, the battery should be prepared to fire two salvos with percussion shell of the type to be employed in the fire for effect. When the aeroplane reaches the position agreed upon, usually above the battery and at an altitude of 500 to 800 meters, the first reference salvo is fired with the shorter range of the bracket increased by 100 m. after an interval of 5 seconds. The second salvo is fired with an increased range of 300 m. The front covered should be at least 100 m. If, after the reference salvos, the aeroplane continues moving toward the enemy, the battery commander infers that the observer has failed to note the fall of the projectile, and the salvos are repeated. The report of the observer should indicate graphically the striking position of the salvos with reference to the objective and contain all other useful information obtained; it is thrown from the aeroplane to reach the ground in rear of the battery. Signal rockets, flags, etc., may be used to convey information when agreed upon.

Each battery is provided with 4 pieces of white cloth, which can be united in pairs to make two signal flags 2 meters square; these are stretched on the ground in rear of the battery, one near to the center gun and the other about 100 m. further to the rear in the plane of fire. When the aviator's report is satisfactory, the signals are removed; otherwise, the observation is continued.

See also
BALLOONS—CAPTIVE

—Fire Control—Faults in

[Common Faults in Conduct of Fire. By Lt. Col. E. F. McGlachlin. 5th F.A. *Field Artillery Jour.*, July-Sept, '15. 3200 words.]

There are no fixed rules of invariable application, but simple principles upon which the battery commander should act. It is better, however, to fire by rule than by caprice. Slowness, lack of concentration, initiative, and decision will make the use of rules necessary. Targets must be correctly and surely identified. Due to extensive use of cover, this will be difficult. Once identified, they must be kept constantly under observation. Failure to

consider the tactical situation leads to poor solution of the task. Much time is lost through failure to transmit available data as soon as obtained. Never use such commands as "steady" or "as you were." They destroy confidence. It may be wiser to permit an incorrect command to go through. Many problems are not solved due to failure to get an appropriate bracket depending upon the nature of the target. Salvos already sensed for range are sometimes unnecessarily repeated. It is wrong to base the limit of a bracket (especially the short limit) on the observation of a single round. Another mistake is to attempt to sense the *amount* short or over. In bracketing for range, appropriate bounds should be made; for an estimated range, 400 yds., range-finder range, 200 yds. Immaterial corrections for direction, distribution, or height of burst, and timidity in making corrections should be avoided. Be careful not to base changes of data on an insufficient number of observations. Under ordinary circumstances, it is sufficient to determine the angle of site to the nearest multiple of 5. The principle of the "drop back" is frequently misapplied. The rule is to fire the bracket; the "drop back" is the exception, is a confession of defeat, and involves a greater expenditure of ammunition. In fire for effect, proper methods of fire must be used and ineffective ranges eliminated. The unit of fire to be used in adjustment is determined by the target, conditions for observation, previous fire, ammunition supply, and the tactical situation. The more accurate the range finding and the greater the necessity of early effect, the more desirable is the use of the battery as a fire unit.

—Fire Control—Instruments

[The Position of the B. C. Telescope. By Lieut. Col. Maximilian Hlubek, 30th Austro-Hungarian F.A. *Mitteilungen des Artillerie u. Geniewesens,* May, '15. 7200 words with one plate.]

This is a mathematical discussion of the influence exerted by the position of the B. C. telescope on the accuracy of firing data, and the conclusions reached are briefly as follows:

Aiming points lying on the side opposite to the base (i.e. directing gun—B. C. telescope) should be selected in exceptional cases only, as the angular errors made are cumulative.

Aiming points in rear of the battery invariably require corrections in laying before fire is opened and thus cause loss of time.

Aiming points in front of the battery, owing to the more or less compact sheaf, do not necessarily require immediate correction in laying.

Aiming points within, or near the battery front, have the advantage of allowing parallel laying of the guns, so long as no change of target is made. During a change of target, they may possibly become located in rear of the battery.

Aiming points on or in prolongation of the base offer the simplest technical conditions for opening fire as well as for change of target.

For a given target, the magnitude of the angular error made in measuring deflection depends upon the distance of the B. C. telescope from the directing gun, and upon the location and distance of the aiming point. The distance of the B. C. telescope, in meters, from the target increases only as the distance of the B. C. telescope from the line of fire increases, whereas the distance of the B. C. telescope, in meters, from the aiming point depends not only upon its distance from the line of fire, but upon the position of the aiming point with respect to the base.

For a given position of the B. C. telescope, the angular error varies inversely with the range and directly with the distance to the aiming point.

The B. C. telescope should be posted not farther from the battery in masked position that is absolutely imperative for observation.

An aiming point lying in a favorable area should be selected. Corrections in deflection need not be made for the time being in case the position for the B. C telescope was chosen within 100 m. of the battery, and the aiming point lies on the target side of the battery. Corrections in laying need not be made before firing, provided the foregoing conditions are fulfilled.

Fire should be opened from the flank toward which the correction in deflection will, in all probability, have to be made, and, in doubtful cases, from the center of the battery.

[A Simple Director. By Major A. G. Leech, R.F.A. *Jour. Royal Artillery,* July, '15. 200 words. Illus.]

This article describes a device, which may be improvised easily, for determining the deflection setting for field artillery when the more accurate instruments ordinarily supplied for the purpose have been destroyed or are not available.

For description and use of the device reference should be had to the complete article.

—Firing regulations

Germany

[The New German Firing Regulations, Jan 11, 1914. (Pt. 2.) By 1st Lieut. E. L. Gruber, 5 F.A. *Field Artillery Jour.* Jan-Mar, 1915. 14,000 words. Continued from the Oct-Dec 1914 number.]

(NOTE.—This is a condensed technical and professional discussion not susceptible of further condensation, the full text being of interest to field artillery officers. Only the salient points can be touched.)

According to the German regulations, the duties of the battalion commander are almost entirely tactical and his interference in the conduct of fire in any battery is warranted only by unusual conditions. He directs the fire of his batteries but never conducts fire unless compelled to do so in exceptional cases, when he must assume all responsibility. The duties prescribed for a battalion commander are more difficult than those of a battery commander and cover a wider scope. Preparatory to firing, he must initiate and complete his reconnaissance, assign appropriate positions and sectors for observation or fire to his batteries.

FIELD ARTILLERY—Continued

The battalion and battery commanders should always give first those orders requiring the most time to execute, and should anticipate those things which are of greatest or immediate importance to their subordinates. Changes of target are usually made at the direction of the battalion commander and to facilitate this, as in instantaneous targets, he will usually have his station near one of the batteries. He must also watch the stage of the ammunition supply. In the choice of targets he is guided by the principle that the infantry must have the maximum support.

The duties of the battery commander are principally technical and include the observation of the sector and the identification of targets; appropriate measures for the observation of fire and the preparation of the elements of fire; establishment of communications; the emplacement of the battery and the necessity for intrenching; disposition of the limbers and provisions for immediate security. To assist him the battery commander has a battery detail consisting of a lieutenant as reconnaissance officer, one orderly n. c. o., two instrument n. c. o.'s, a telephone detail of three men, and the personnel attached to the observation wagon. This wagon is equipped with a ladder and has a receptacle for all instruments used in observation and fire control. The battalion commander has a similar observation wagon; the limber of this wagon holds 36 rounds.

The firing instruction of the personnel is very systematic. In this instruction the battery is considered as a school. Non-commissioned officers are given opportunity to exercise higher command and to conduct fire. Great stress is placed upon developing the vision of the cannoneers and instruction in this is very methodical. Recruits do not all receive the same instruction. According to aptitude, their instruction is specialized as cannoneers or drivers. The instruction in a battery is usually divided into several departments, each in charge of a subaltern who is assisted by several n. c. o.'s, all under the supervision of the captain. Under such a system, so called "examinations for promotion" are unnecessary.

This individual instruction begins about the middle of October. In addition to cannoneers, instruction, the recruit instruction includes gymnastics, dismounted drill, equitation, visual training, personal hygiene, care of equipment, etc. The cannoneers' instruction includes instruction in setting the sights and in laying the gun. In addition to the guns, several sets of sighting apparatus are available in each battery. This preliminary individual instruction is the most important part of the recruit's instruction. Every duty that he performs, every part of the matériel that he handles, its action, function and relation to the other parts, and the work he is performing are carefully explained to him. Proficiency in this preliminary instruction is expected by the end of January, at which time the battalion commander makes a minute inspection of the results obtained in all his batteries. This inspection covers about a week. The recruits are then gradually absorbed into the battery, and in April the battalion commander again makes a careful inspection of the battery training.

After January the best recruit cannoneers are selected for special gunner's instruction. Their technical training is carried to the highest possible stage so that in each battery a maximum number of qualified gunners will always be available. They cannot be transferred from the battery. As an incentive to the gunners, two competitions are held annually after the completion of the firing practice. The first competition is for recruit gunners and one year volunteers only. There are three tests with a total of eight trials, all elementary and designed to show the candidate's accuracy and speed in laying and setting. The second gunners' competition is open to the six best gunners of the battery. It consists of four practical tests with a total of eight trials. The Germans make it a principle to separate the honors from the office and thus always hold out an incentive for greater efficiency. For this purpose gunner's badges in ten grades are provided for distinguished service during the firing practice. Each year a higher grade may be earned. The German system of gunner's instruction is very practical and the creation of additional honors as an incentive to *continued* efforts is an excellent idea.

Our (U. S.) gunners' order is in great need of a revision on more practical lines. Badges and honors for continued efficiency should be given as in the Infantry and Cavalry. At present, artillery gunners are placed at a great disadvantage in pay as compared with the other branches.

Each battery has, in addition to the scissors observing telescope, two aiming circles and a range finder. The Germans have developed a method by which one of these aiming circles is set up in rear of the battery, from which position it reads the deflection to each gun in turn and is then used as an aiming point by the guns to establish their initial direction. After this has been obtained, each gunner chooses his own aiming point and thereafter lays upon the latter, thus liberating the aiming circle. The n. c. o.'s operating the aiming circles have offset tables to assist them in quickly correcting the deflection. The aiming circle is a light and compact instrument provided with a compass which is used to lay the guns when the battery commander's station is not visible either from the second aiming circle or from the firing battery. The German instruments are all graduated clockwise, which has many advantages.

Successful battery training is based upon a thorough individual instruction. Battery commanders must purposely seek difficult situations, in order to test the initiative, resourcefulness and training of the different units and personnel. There must be frequent practice in intrenching, especially the battery observing station. The battery commander must train both his active and reserve officers and n. c. o.'s in the observation and conduct of fire, and in this instruction must insist upon strict fire discipline and proper methods. Rec-

ords are always kept in order to permit comparison and discovery of errors after the exercise.

For the preliminary battalion training, batteries can be dispensed with and only skeleton details employed. The battalion commander must give variety to the training by creating proper tactical situations. Frequent practice must be had in the service of communications. The tactical fire direction is the most important part of the battalion commander's duties, and his difficulties in this respect will increase when his batteries are distant from him.

Scouts, agents, patrols, auxiliary observers, etc. have practically the same duties as prescribed in our drill regulations.

Proficiency in firing is of first importance and for this instruction the necessary means must be provided by higher commanders. All officers below field rank, both active and reserve and senior n. c. o.s are required to fire. Firing practice is divided into (a) Instruction practice, usually for the battery only; (b) Battle practice, for both battery and battalion and for higher commands.

Instruction firing practice may be held at any time of the year. The regimental commander determines its requirements and allots the ammunition. No other exercises or duties are permitted to interfere with this instruction, which is progressive and is intended to give elementary training in the conduct of fire to subalterns and qualified n. c. o.'s and to give the battery commander an opportunity to perfect the fire discipline of his battery. It also offers an opportunity to give the recruits, gunners and other men an actual representation of the elements and the theory of artillery fire.

Battle firing practice is the culmination of all firing instruction, just as the annual maneuvers are the culmination of all maneuver and tactical instruction. Everything which approximates the realities of war is permitted. The battery commander or any member of the battery personnel may be "killed." Certain guns may be ruled out as damaged or destroyed, in fact anything is permitted which is likely to disturb the fire discipline. To test the technical skill of the battalion commander several targets are made to appear simultaneously in order to see whether he will choose and assign them in the proper order in accord with the tactical situation and the amount of ammunition on hand. New situations requiring quick tactical decisions are constantly introduced. Battery battle practice is under the direction of the battalion commander; battalion practice under the regimental commander.

The Firing Records prescribed are later used for statistical purposes. The annual allowance per battery is about 700 rounds. The German Field Artillery holds a greater part of its firing practice in a different locality each year. The precautions for the safety of the range are very strict and include the police of the ground after the completion of the firing. Rewards are paid for the discovery of unexploded projectiles, which are then exploded by a police detail.

Our (U. S.) regulations are splendid and reflect the high professional ability of those who prepared them; but we lack the proper military system to carry out the spirit of the regulations. Our officers and n. c. o.s may have the genius, but they lack the experience and the opportunity to carry out an intensive method of individual instruction. This can be corrected (a) by simultaneous arrival of all recruits and their assignment to a single organization; (b) by preparing the proper instruction personnel before the arrival of the recruits; (c) by prohibiting for the first six months all so called battery drill and tactical instruction, or anything else which will interfere with the thorough individual instruction of the recruit.

—Firing Regulations—Duties of Battalion Commander

[The Duties of the Battalion Commander of Field Artillery. By Alberto Porro, Major of Artillery. *Revista di Artiglieria e Genio.*, Feb, '15. 6000 words. 1 plate.]

The regulations prescribe in detail the tactical duties of the battalion commander, but have little to say about his functions in the conduct of fire. There are, nevertheless, many cases where it is necessary to bring the battalion into action, but where the battery commanders cannot all find observation stations. And while it is almost axiomatic that the officer who conducts the fire must be able to see what he is doing, the rapid course of peace maneuvres often leads to firing almost at random, to avoid the necessity of a slow and difficult preparation of fire. It would seem that the fault is due to our habit of separating too sharply our tactical and firing exercises.

It may be of interest to examine certain cases of conduct of fire by a battalion commander for two or more batteries of his battalion, which have been practically worked out.

A.—A natural aiming point can be found, visible from all the guns and from the battery and battalion observation stations.

B.—The same, except that each battery has a separate aiming point.

C.—No natural aiming point can be found, but it is practicable for all batteries to use the battalion commander's telescope as an aiming point.

D.—No natural aiming point can be found; the battalion commander's telescope can not be seen from the guns, but each battery commander can see both the battalion commander's telescope and his own guns.

E.—Some of the battery commanders can not place their telescopes so as to see both the battalion commander's telescope and their own guns.

These cases may all be solved by reciprocal pointing of telescopes and gun sights (using an intermediate station when necessary, as in Case E); telescopes and guns being thus brought parallel, the battalion commander can turn any selected battery upon any desired target by calculating the amount to be added or subtracted, taking into account

FIELD ARTILLERY—Continued

the relative positions of target, aiming point, gun and observation station. The process is easier if the telescopes are provided with compasses, but is practicable without.

Such procedure, however, should be considered as exceptional; the battalion commander should not unnecessarily assume technical work which may interfere with his tactical duties. The functions of the captains reduce themselves to translating the information that they receive into deflections and ranges; but they should be kept informed of the tactical situation, so as to be able to act intelligently when a change of position or of target enables them to resume their proper functions.

It is here assumed that no difficulty is found with the communications. With the existing equipment and proper care in training the men, there should be no failure in this regard. Battalion commanders should, however, always be provided with ample and complete equipment, and a suitable cart should be issued to carry it.

On account of safety considerations, battalion firing exercises are too apt to assume a purely tactical character, and to become merely battery firing problems in a battalion setting. It seems desirable, therefore, that the Firing Regulations be amended so as to lay stress upon exercises such as outlined above.

(Note.—The technical methods used in securing parallel laying in each particular case herein distinguished are more fully explained in the text.)

—Harness

See

HARNESS—FIELD ARTILLERY

—Heavy

[Modern Artillery. *Canadian Military Gazette,* June 8, '15. 350 words.]

The employment of large caliber guns did not come upon the allies as a surprise, though they had made no adequate preparation to meet it, and as a consequence were caught napping. The increase in numerical strength of the Allies was counterbalanced by the Germans bringing forward on the western lines guns of increased caliber. However, these guns take a long time in building, and consume enormous quantities of ammunition, in addition to their comparatively short life.

There is an added difficulty in their operation in that the mechanism and sighting of these huge guns requires skill not ordinarily possessed by a gun detachment and they are for the most part worked by experts sent by the Krupp works.

Italy

[Italian Heavy Field Artillery. Note. *Scientific American,* June 26, '15. 200 words.]

The Italian government has taken to heart the lessons of Liége, Namur, and other places where permanent fortifications have been reduced by gun fire, and has provided a very effective 12-inch howitzer. This has been used against the Austrian forts guarding the frontier.

France.

[French Artillery—The Heavy Field Batteries. By G. N. Tricoche, late Lieut. French F. A. *Field Artillery Jour.* Jan.-Mar., 1915. 3200 words.]

The French have neglected howitzer and heavy batteries in general, possibly because they have become hypnotized by their 75 mm. light gun. Heavy batteries are looked upon as suitable for siege operations only, and since the French have believed that the German concentration would be more rapid than their own, they have left siege operations with the Germans and therefore considered heavy guns luxuries. In recent years there has been much uneasiness on this question, and a few batteries of 105 mm. guns and 155 mm. (Ramailho) howitzers were introduced. The Germans distribute their heavy artillery among the army corps; the French distribute only the 105 mm. gun and reserve the heavy howitzers for the army commanders, because large projectiles are not necessary to destroy shielded artillery, but rather a large number of small high-explosive projectiles. The heavy 105 mm. gun was needed by the corps commander to obtain cross fire in connection with the 75 mm. gun. They could also be used by them to compel hostile columns to deploy, leave roads, or to make a detour.

Cross fire is very much in favor in France. For this purpose, a range of 10,000 meters is desired. Mobility is the second requirement. To be really mobile, a heavy gun should not exceed 4850 pounds in draft, but the 105 mm. gun exceeds this by almost 900 pounds. Many think that one or two thousand meters' range should have been sacrificed and greater mobility obtained by reducing the weight.

Before the war the following requirements for the French heavy batteries were considered desirable: 3 guns per battery; 13 caissons; each gun provided with drag ropes to facilitate handling and to shift the gun from the firing to the traveling position. Greater defilade was necessary on account of the larger flash and smoke on discharge, in order to be surely hidden during cross fire, and to make discovery which would involve a change of position more difficult. Indirect fire would be the rule, and therefore telescopic panoramic sights were necessary. Since firing would be at long ranges, powerful telescopic observing instruments were required. Aeroplanes could also be counted upon to give more assistance, but would be at greater distances from the battery than for the light gun. Paradoxical as it may seem, it is proposed to increase mobility by mounting the cannoners as in horse batteries. These mounts could be provided with breast straps and traces (*faux-poitrail*), as in the horse artillery, and used in emergency for draft purposes.

The following objections to long range heavy field guns are made: In executing cross fire, such batteries must expose their flanks; to obtain proper defilade and to prevent discovery, they must be withdrawn too far from the line; at long ranges the visibility of targets requires good weather conditions; ammunition supply is small and replenishment difficult; on account

of flat trajectory and necessity for large defilade, there is doubt whether heavy guns could produce efficient cross fire; a large number of small but efficient projectiles is much better than a limited number of big shells too powerful for the object in view.

Germany

[Germany's Big Guns. *Army and Navy Register,* Sept. 4, '15. 600 words.]

The Germans use, besides field guns proper, 10 cm. and 13 cm. guns (range, 6.2 and 8.1 miles, respectively), 15 cm., 28 cm. howitzer. The 28 cm. is the piece which has done the greatest amount of damage during the war. Special pieces are the German 42 cm. mortar and 38.1 cm. gun, and the Austrian 30.5 cm. gun. The Austrian 30.5 cm. automobile mortar shares with the German 28 cm. howitzer the distinction of having wrought the greatest amount of destruction of forts. This mortar, with its equipment, forms a complete traction set for road transport. For a battery of two mortars there are three traction engines, each pulling four trailers.

Great Britain.

[British 5-inch Gun. *The Sphere.* Feb. 27, 1915.]

From pictures and descriptive notes, the following may be gleaned. The gun has long recoil, hydraulic recoil control with spring return. It can be traversed 8° on the carriage. The top carriage is shifted along the trail to the traveling position. The wheels have broad tires and double spokes. The gun and limber are drawn by eight horses, and the piece is served by a detachment of ten men.

United States

[The Use of the 4.7-Inch Gun in the Field. Prepared in the 5th Field Artillery. *Field Artillery Jour.,* Apr.-June, '15. 3000 words.]

The 4.7-in. gun is the standard heavy field artillery gun, resembling the 3-in. gun in every respect except size and mobility. It usually operates with infantry, being detached from army troops only as occasion may demand. The projectiles are more powerful, accuracy being limited more by difficulties of observation. Ammunition supply is smaller, necessitating more deliberate adjustment and strict economy in its expenditure. The caisson limber is placed alongside the gun with the caisson. This gives the cannoneers more protection, but also makes a more vulnerable target. The heavy gun is vulnerable to a close attack by infantry and cavalry, especially when on the march. It should be used to take up the work where the 3-in. gun begins to fail (4000 yards). There is greater latitude in choice of position than with light guns, but errors made are liable to prove more costly. Reconnaissance must therefore be more carefully made. Long-range fire is not justified when its greater efficiency can be used at shorter ranges. Usually more than one observing station will be necessary. Senior heavy artillery commanders should always be ordered forward for reconnaissance when it is contemplated to use these guns. Teams may be placed at a greater distance from the battery under cover. Combat trains should be brought up as close as possible. On account of the limited amount of ammunition carried its supply must be prompt. Changes of position will be rare. The use of the heavy gun in the advance guard would be very unusual. In the attack it would be used:—to combat hostile artillery; to cover deployment of friendly infantry and artillery, while preventing a similar deployment on the other side; and to assist in flanking and enveloping movements. On the defense it would be used:—to force early deployment of or compel turning movements by the hostile force; to support offensive returns and counter attacks; and to cover pursuits or retirements. In rear guard actions, the heavy guns may be used to gain time by their long-range fire. Higher commanders must be careful to assign appropriate tasks to heavy artillery.

—Heavy—Organization and equipment

[Hints on Organization and Training for Heavy Artillery. By Lieut.-Col. H. DeT. Phillips R.G.A. *Journal of the Royal Artillery.* Mar., 1915. 1200 words.]

The first requirement is a good Quartermaster Sergeant. System in drawing equipment will advance the time when training can begin. In rapid raising of a battery, one officer should be assigned to the drawing of equipment. another to drawing horses and their subsequent care, another to the guns and technical equipment, and another to the training of the battery staff, with special attention to signallers. Field dressings and identity disks should be issued. The training of horses in teams should be started as soon as possible. All men should be accustomed to turning out in marching order.

Pneumonia and strangles have been the most prevalent diseases in recent months. Owing to mud, cracked heels have been a source of trouble.

Ammunition wagons are too heavily loaded. Weight is saved by providing battens to hold shell in place, and discarding the outer cases of the cartridges.

Wagon covers must be well cared for to keep ammunition and baggage dry. All guns, vehicles and covers should be painted good colors for concealment. Lanterns are very important, and there should be one for each vehicle. Map reading must be taught to officers, n. c. o.'s, and orderlies. Officers should lay out lines of fire by map and compass. All personnel should be taught to set fuzes and *clamp* them. Men should be interchangeable in duties. Signallers must be expert at sending and reading on the buzzer. All cutting tools should be kept sharp, all harness and boots well oiled.

When shooting by maps, be prepared to apply gun corrections for the error of the day.

Particular attention should be paid to gun drill, march, discipline, telephony, map reading, care of equipment, and care of horses. They mean efficiency.

—Influence of Ground on

[Influence of ground on the Organization and Tactical Employment of Artillery. By Capt. M. Urrutia, Chilian Army. *Memorial*

del Estado Mayor de Chile, Apr '15. 3000 words.]

Due to the weight of carriages necessary to transport guns and ammunition, field artillery has to pay more attention to ground than any other arm, though, thanks to the principle of indirect fire, this problem is now greatly simplified.

In war, troops employ most of their time marching; hence in studying the organization of any arm, the system of roads in which campaigns may take place must be taken into consideration. Generally the desire to acquire powerful weapons overrides the considerations of transportation. The American countries not being producers of heavy guns, the European types have usually been adopted, although these types are not suited to American roadbeds—the European roadbed being far superior. Besides, the European draft animals are better.

Military commissions sent to Europe to select guns have been carried away by patriotic desire to arm the country as strongly as possible, and have done so at the cost of mobility. It would seem desirable to compromise, even at the cost of some ballistic qualities, to get greater mobility.

In many of the mountain and desert districts of the American countries wheel artillery is impracticable, especially in view of the enormous amount of ammunition to be carried. This has necessitated the adoption of much pack artillery.

The Balkan States used considerable heavy artillery with success in the war of 1912-13. In the present war the artillery is of the very heaviest type, yet Switzerland holds to smaller calibers for her mountain country, even with the best of roads; and the Chilean should be less than the Swiss calibers.

One alternative to permit the employment of heavy artillery would be to use bulls and oxen for draft animals, and to select in advance emplacements for the guns, thus giving to them practically the employment of siege artillery; but with little mobility.

As one of Chile's neighbors has adopted heavy types, Chile cannot well renounce heavy artillery herself, yet for operations against other neighbors, light mountain guns on packs are necessary.

In broken ground artillery must not be employed prematurely—before the situation is entirely cleared up—since the immobility of heavy guns especially renders them liable to surprise. Experience in the Russo-Japanese war indicated that horse artillery and mountain artillery on packs are especially liable to danger when changing position; though the use of indirect fire has rendered all classes of guns secure when firing.

In rough country it sometimes becomes desirable to place parts of the artillery command directly under the orders of the commanders of the infantry supports, in order to afford co-operation,—the artillery commander reserving enough for his own purposes.

In desert, or sandy country, rapid movements of artillery raise clouds of dust, so that movements should of necessity be slow. On such ground percussion shells cannot be used, as they produce little effect.

As an auxiliary of both artillery and infantry, on rough ground, machine guns cover dead spaces, permitting an uninterrupted infantry advance under cover of constant artillery fire.

—Instruction and Training

[Contemporaneous German Advice on Artillery Training. Editorial. *Field Artillery Jour.*, Jan-Mar, '15. 200 words.]

Instruction in intrenchments and in the reconnaissance of the enemy's artillery in a covered position are most important. Batteries are frequently used from isolated positions. Strict economy in the expenditure of ammunition is enjoined. There must be frequent practice and co-operation between the artillery and the aeroplane service. Aviators should be provided with pistols and hand grenades, which tend to create alarm among the enemy.

Austria

[The Austro-Hungarian School of Fire for Field Artillery. Anonymous. *Mitteilungen des Artillerie u. Geniewesens*, Mar., '15. 5000 words.]

Telephone and visual signal communications.

With the introduction of field telephone and visual signal equipment, the communicating system of field artillery has been placed on an entirely new basis.

A special course at the School of Fire for Field Artillery, open to subalterns and experienced non-commissioned officers of field artillery, is provided to develop teachers in telephone, signal, artillery reconnaissance and ranging duties.

This course consists of four weeks' theoretical instruction combined with small practical exercises on the ground. One hour is devoted daily to taking of telephone messages. In addition, visual signalling is practiced daily.

The theoretical course is followed by a practical course which consists of mounted and dismounted exercises on the ground, two weeks with a battery, one week with a battalion, one week with a regiment, and a variable period with larger, artillery units. Instruction is likewise given in signalling with electric lanterns. Students are detailed as commanders of artillery units, as range finders, etc. Some instruction is given in artillery reconnaissance and in observation.

During the last four weeks of the course, students are detailed as artillery patrols and as telephone officers in connection with firing exercises at the School of Fire.

Thorough instruction is given in locating and correcting all kinds of station and line troubles.

Telephone and visual signal systems are used in combination or separately, the choice of either or both depending upon the tactical situation and the ground.

The success of telephone and visual signal

communication depends upon the selection and training of the personnel which should be permanently detailed for this duty. Visual signalling must be taught in the open, the stations being far enough apart to prevent the men from calling to each other.

Telephone stations should be established in immediate vicinity of their commanders. All commands should be transmitted word for word and repeated in the same manner. Once established, stations should not be shifted when that can be avoided. Instruments should be so held that wind can not blow into transmitter. The insulated wire of the telephone should be protected against dampness. When practicable the entire line should be raised off the ground. Breaks can be avoided by careful reeling. Reliefs should be provided for all operators. Whenever messages are not being transmitted, operators should call serial numbers to each other at stated intervals so that any break may be promptly noticed.

Call letters should be permanently assigned to various signal patrols assigned to visual signal duties.

Artillery patrols should before their departure arrange for communication with observation station. In locating a visual signal station, the selection of uniform background is an important factor. Large flags should be used only in case small ones are no longer visible. Visual signalling should invariably be taught on varied ground.

[Indoor Terrain for Artillery Training. By Maj. R. H. Dunlap, U. S. M. C. *Field Artillery Jour.*, Apr.-June, '15. 1000 words. 2 illus.]

The device described consists of a panoramic scene representing profiles of hills, and a skeleton frame for moving two arms carrying two squares representing bursts. This practice gives the means of training officers and men in conduct of fire, observation and panoramic sketching. The drawings and description give complete information concerning the use and construction of the device.

[Letters on Artillery Matters. *Schweizerische Zeitschrift*, Apr., '15. 1300 words.]

(Note.—This article is an exchange of letters between two Swiss officers and deals chiefly with the subject of tactical training for artillery officers.)

The tactical training must start with the cadet and be progressive. The course of training should be so correlated that one step follows naturally on the previous one. Of late the whole idea seems to be how to train the younger men and, as a result, the advancement of the older officers has not kept step with that of their subordinates. This is fundamentally wrong since the man who holds the highest position of responsibility should be the very one to be trained to the minute. There is no such thing as being completely educated. The education of the higher officers presents a greater problem than that of their juniors, since they have not only to keep up to the times, but also to learn over again and modify the fundamentals which they were once taught. Poor correlation of the course of training increases enormously the work to be done by the older officers. Unfortunately this work should be done, but is not.

As for the training of the younger men, it is to-day a case of too much technique and not enough tactics. The subalterns are crammed so full of technical details that they are apt to forget that the gun is a weapon and not a laboratory instrument. This side of the question is undoubtedly necessary to those intrusted with the development of artillery and to a certain extent also for an understanding use of the same, but it should not dwarf the tactical considerations. For the artillery officer it is eminently more important that he should learn to handle men, to deal with situations, and to find his own limitations in this respect, rather than to devote his time to the theories of gun construction and ballistics. The latter he will never have occasion to use. The tactical and not technical training is the one most apt to lead to the best utilization of the equipment.

Switzerland

[Letters on Artillery Matters. Anonymous. *Schweizerische Zeitschrift*, May, '15. 2600 words.]

(A further exchange of letters between two artillery officers on the subject of tactical training for younger officers.)

In these letters, as in those of previous dates, the argument is "Less Technical and More Tactical Training." The conclusion is reached that technical subjects have been given preference over tactical ones, since the former permit easier assignment of work, and require less imagination and ingenuity on the part of those responsible for the instruction. When the Swiss Army was reorganized in 1874, one of the regulations called for a certain amount of study and preparation to be done by the officers in their free time. This regulation contemplated that the work should be assigned by officers in command of large units. For a time the work was well laid out, and the younger officers had valuable instruction. They profited by the criticism of their solutions of tactical problems by officers whose experience and sound judgment had placed them in positions of high command. But this state of affairs soon gave way to another in which the instruction of younger officers was intrusted to their direct superiors. Many company officers had not yet demonstrated their worth, and, in consequence, the lieutenants were instructed according to the views of individual captains. The instruction lacked uniformity and was not as sound. The efficiency of the captain was largely reflected by the showing of his subalterns. While this side had its merits, still it is a process which does not tend to the benefit of the service as a whole.

[Letters on Artillery Instruction. Anonymous. *Schweizerische Zeitschrift*, June, '15. 1600 words.]

The instruction given to the younger officers

FIELD ARTILLERY—Continued

should be so arranged and correlated that the first lessons will constitute a thorough foundation upon which the later instruction can be built. This necessitates a well-established and uniform system. Continual changes of system and instructors defeat the object of the instruction and work untold hardships on all concerned.

In former years, the tactical studies were carried out much according to the personal ideas of the instructor. They were largely practical. Theory and practice were closely related. Often after a discussion on a certain problem in the classroom, the class went into the field with skeleton organizations and actually executed the maneuvers on the ground. This was indeed beneficial, but the personality of the individual instructors determined the value of the instruction. Uniformity could not be expected and was not obtained. Soon the freedom allowed the instructors was limited, and standard works on tactics came more and more into use. Eventually the study of tactics became largely a matter of book knowledge. The field exercises were no longer a feature of the work, and the younger officers split hairs over the penetration of shell, the dispersion of shrapnel fire, and similar technical details. One sees here where "technique" commences to crowd "tactics." Instead of improving, conditions have been becoming gradually worse—that is, from a tactician's point of view.

Unfortunately,the question of grading officers upon their standing in class has been given more weight than the question of teaching them the art of handling troops. Those responsible for the system of instruction lay stress on the fact that technical subjects are best suited for training the minds of younger officers; that the mental discipline of ballistics, for instance, is necessary in order that the subalterns may afterwards grasp other subjects in a truer perspective. To this same school belong the pedagogues who would teach Greek and Latin all the way through the grades from kindergarten to college, for the mental gymnastics, not for the practical usefulness of the subjects.

Let us not lose sight of the fact that *tactics* and not *ballistics* will save the situation. When the enemy's hordes are within the borders, the rôle of ballistics has been played, that of tactics just commences.

United States

[The Selection and Training of Non-Commissioned Officers. By Lt. J. Andrews, 1st F. A. *Field Artillery Jour.*, Apr.-June, '15. 2500 words.]

In order that any officer other than the regular battery commander may get the maximum efficiency out of a battery, a uniform system of selection of privates and training of non-commissioned officers should be adopted and standardized. There will then be available a reserve of trained non-commissioned officers to meet any emergency. To accomplish this, there should be established in each regiment or separate battalion a school for non-commissioned officers. The instructors should be officers with special qualifications, and non-commissioned assistants should be preferably graduates of the School of Fire. The personnel of the class should be composed of selected privates who have shown special qualifications. The course should cover six months and comprise the following subjects: (1) Drill Regulations, 80 hrs.; (2) Service of communications, including semaphore, wig-wag, telephone and buzzer, 80 hrs.; (3) Topography, map reading, map problems, 40 hrs.; (4) Care, use and adjustment of all the battery fire control instruments, 80 hrs.; (5) Construction, operation and care of material, 40 hrs.; (6) Artillery draft (or packs), 40 hrs.; (7) Hippology and care of horses, 20 hrs.; (8) Equitation and horse training, including draft training, 120 hrs.; (9) First aid, hygiene and sanitation, 20 hrs.; (10) Recruit instruction, 80 hrs.

Final standing and proficiency should be determined by the daily credits earned and by the aptitude of the pupil. Aptitude should count about one-third.

[Training a Battery for Field Service. By 2d Lt. J. E. Hatch, 1st F. A. *Field Artillery Jour.*, Apr.-June, '15. 3200 words.]

The objects are: to thoroughly instruct all the personnel in their prospective field duties; to increase their confidence and mental activity; to test all existing methods and discover improvements; and to give officers and n. c. o.'s training in preparation for higher duties in war. It is advantageous to receive all the recruits in one annual installment. The n. c. o. assistants should be selected and trained in their duties before the arrival of the recruits. A personal record of each recruit should be kept. Squads should consist of from 15 to 20 men. Periods of drill short and frequent. Zeal should be rewarded, and cannoneers' instruction at the guns frequently supplemented by talks on related subjects. Drivers' instruction in equitation and draft training, 1½ hours each day. Foot Drill and physical training, 1 hour each day. General instruction in the pistol, tent pitching, signaling, etc., 2 hours each day. In all instruction, the men should be graded and classified. In the beginning, go slowly and pay much attention to details and the explanation of operation. At the end of eight weeks, the recruits should be placed in the battery, and instructions in the firing battery and the battery mounted given. Men selected as drivers or cannoneers should be given special instruction in their specialty in the afternoon. The battery detail should also be instructed in its duties, and. in addition, it should receive some simple cannoneers' instruction. A school for n. c. o.'s and selected privates should be established. At morning drill, everyone should be kept busy. Training in marching with full field equipment begins after progress is made in battery training. In this field service, the marches and difficulties should be increased gradually. In all this training a flexible program should be planned and adhered to.

See also
FORT RILEY MOUNTED SERVICE SCHOOL

—**Instruction and Training—Militia**

United States

[Instruction of the Field Artillery in the National Guard. By Maj. A. M. Bush, F. A., Ohio N. G. *Field Artillery Jour.*, Apr.-June, '15. 6000 words.]

The American people lack military sense and spirit because our teachers and politicians have falsified our history and taught that our geographical location makes military training and preparedness unnecessary. To most of them, liberty and freedom mean license. This feeling also permeates the Guard, hampering progress and instruction. There is sometimes open defiance to the instructions from superiors, not so much intentional as it is a habit of considering personal likes of paramount importance. The machinations of politicians, the hostility of labor leaders and anarchists, the opposition of business men, pacificists, and officers of the law, the apathy of the fond parent and the people in general—all these are mobilized to prevent the maintenance of a military establishment.

Guard battery commanders are subjected to many trials and disappointments. The recruiting problem can be solved only by some impending danger which will produce either a change in public sentiment or compulsory service. Attendance at drill is small and irregular, amounting to less than 72 hours per annum. The average enlistment is about 1½ years in the Guard. As a result, no systematic training can be undertaken. The most work is accomplished in the ten days of camp. Discipline is poor, so that the training is hasty and superficial and usually never gets beyond the elementary stages. There are many obstacles which prevent the enforcement of discipline, among them the pettifogging interpretations of military law by law officers and the influence of the yellow press. Nevertheless, the discipline in the Guard to-day is far better than it was in our volunteer armies in the 60's. The financial support for field artillerv by the State governments is spasmodic and inadequate. Most often the funds are obtained by private subscription or by assessment on members. Batteries have no horses, and the men are inexperienced in the care of horses and equipment and in the fitting of harness. Petty jealousy and ignorance of field artillery matters shown by some higher officers and by the other arms is also injurious. Qualifications other than military usually determine the selection of officers. As a rule, they learn their technical duties after being commissioned. College graduates with an engineering training and willing to learn by experience would make the best officer material.

The presence of inspector instructors on occasional visits and the work of the sergeant instructors has done much to standardize the instruction. The schedule of instruction suggested by the division of militia affairs crowds in too much theoretical work. In militia batteries, a large proportion of the time available is lost, due to inexperience, lack of system, improper control, absentees, etc. The value of the National Guard batteries as a fighting force is doubtful, but with additional training, the adoption of a sound military policy, and an increase in the regular army, this could be remedied. The average strength of militia organizations is only 50% of the peace strength. The injection of a large number of untrained men on the outbreak of war would make them well nigh useless. In 1914 the Guard showed 3 regiments, 10 battalions and 19 separate batteries of field artillery which were short 95 officers and 4698 men. The plan of the General Staff calls for 30 regular and 12 militia field artillery regiments, requiring 2000 officers and 11,848 non. com. officers, which it will be impossible to obtain under our present system and training. All present batteries should be organized as training schools for volunteer officers of field artillery. Our universities would make ideal places for instruction batteries. They should be under exclusive Federal control and carry out occasional periods of service with regular batteries. To accomplish these things, there must be a change made in the Constitution and in the sentiment of our people. The above facts may be distasteful to many, but it is best to speak plainly of our deficiencies so that we may correct them.

[Intensive Training for Volunteer Batteries. By 1st Lt. G. H. Paine, 3rd F. A. *Field Artillery Jour.*, July-Sept., '15. 3500 words.]

The suggested scheme is based on the assumption that the captain is a competent regular officer; that 5 per cent of the enlisted personnel have had previous service in the regular field artillery; that four lieutenants have been given volunteer commissions; and that all horses, men, and matériel are on hand.

First day: Divide the battery into fire sections; assign one officer to interview every man and prepare a list showing previous occupation or service, aptitude and probable position in the battery. From these lists and upon the officers' recommendations, all assignments above that of private are made, including staff sergeants, cooks, chiefs of section, gunners, and drivers.

Second day: The horses are assigned and cared for. Cannoneers' instruction for one half battery; carriages arranged in park; equipment issued.

Third day: Complete issues; select horseshoers and mechanics.

First week: Begin program of instruction, involving physical training, foot drill, cannoneers' instruction, pistol manual, cleaning and care of horses and harness, school for officers and non-commissioned officers.

Second week: Cannoneeers' instruction and equitation, otherwise same as first week.

Third week: Instruction of special details; semaphore; cannoneers' instruction; equitation; battery in fire discipline. Otherwise same as first week.

Fourth week: Select battery detail; drivers' drill by pairs and team; refit and adjust harness; cannoneers' instruction and battery fire discipline; equitation for cannoneers.

FIELD ARTILLERY—Continued

Fifth week: Battery drill at walk. Otherwise same as fourth week.

Next four weeks: Complete training in battery by occupying position and simulating fire; special field instruction.

In addition, pistol practice every afternoon for one hour. Road marches: sixth week, 10 miles; seventh week, two, 10 miles each; eighth week, 15 miles with camp or bivouac at end; ninth week same with 20 mile march.

Every possible effort should be made to obtain ammunition and facilities for target practice. By the above scheme it should be possible to turn out a battery capable of caring for itself in the field, marching with a division, placing guns in position to fire and delivering an effective fire.

—Marine Corps

[United States Marine Corps Field Artillery. By Capt. R. O. Underwood, U. S. M. C. *Field Artillery Jour.*, Apr.-June, '15. 4500 words. 4 illus.]

Each capital ship of the Navy carries a force of 70 marines. The marine force from two ships is combined into a company of 140 men with proper complement of officers. The purpose of this force organized into battalions and brigades upon landing, is to protect the advance base or to seize and destroy hostile bases. In former times the rifle and machine gun were the only weapons, but recent experiences have shown the necessity for field artillery with such a Marine force. Even if not used, their moral effect is great as at Oriente, Cuba. The study of field artillery was first taken up at the Advance Base School in 1911. Practical work was not undertaken until later. In 1912, a company with field pieces was sent with the Nicaraguan Expedition. The officers and men of this company knew little about firing a battery. The two Nicaraguan positions Coyotepe and La Barranca, which commanded the city of Masaya and the railroad were well entrenched, protected by barbed wire entanglements and defended by infantry, machine guns, three 3-in. field guns, and several obsolete 1-pounders. When the first battalion of marines came up the railroad, within range of the field artillery at Coyotepe it was fired upon. Two more battalions of infantry were then brought up and the marine field artillery placed in position to cover the forts. Word was sent that if passage of troops was not permitted, the rebels would be attacked by superior forces. Assent was at first given but the railroad was soon attacked and it became necessary to use our field artillery. Adjustment was by piece, time fire at first and then by percussion fire because the fuses acted poorly. The results were poor and observation difficult. La Barranca was attacked by percussion fire with better results. The next day Coyotepe was again bombarded, better results being obtained with indirect laying. During the night of Oct. 3, the bombardment was continued in order to prepare for the infantry assault the next morning. Owing to faulty ammunition, poor implements for handling it, and lack of reliable communication between the infantry and the artillery, no support was given by the latter. Proper co-operation would have broken down all opposition to the infantry. When our infantry advanced, the rebels again lined their trenches to fire upon us. During the assault a small field piece was concealed by the enemy in rear of Coyotepe. This gun attacked our hospital train when it advanced. Two percussion shots at 1700 yds. caused the gunners to abandon their gun. The question of transportation was also a serious problem. Man power, oxen and mules were used. None of them is satisfactory. The men should not be required to expend their energies in dragging guns over difficult ground.

In February 1913, an artillery company was organized and given systematic training at Guantánamo, Cuba. Officers were sent to the camp of instruction for field artillery at Tobyhanna, Pa. In the fall, another company was organized. In April, 1914, a third company was organized and a battalion of marine field artillery formed. The lack of suitable draft animals, and the difficulties of training such animals has been a great handicap. Motor transport is suggested. At Vera Cruz one battery seized a sufficient number of draft animals. The other two companies later obtained native mules and were called "Rabbit Batteries."

4.7-in. guns have also been tried, but the difficulties of transportation are too great and the design of the carriage not suitable to the work. It is suggested that three types be provided: the 3-in. mountain howitzers; the 3-in. light guns and the 4.7-in. guns with split trail. One battalion of each type should be formed. At the artillery school, Marine Barracks, Annapolis, many tests and experiments are being carried out to remedy defects not only in organization and matériel but also in training.

—Matériel

See also
PINTLE (ARTILLERY CARRIAGE)

Great Britain

[The Latest English Guns,the 4.5-inch Field Howitzer and the 2.95-inch Mountain Gun. Editorial. *Kriegstech. Zeitschrift*, May-June, '15. 1000 words. Six illustrations.]

The specifications for these two weapons were given out early in 1914. The 4.5-inch howitzer has been in a continuous process of experimentation and development since 1908. In 1910 it was issued to the army, but quickly withdrawn on account of the numerous defects which were discovered while in service. The piece was modified and a new type of ammunition adopted before it was again issued.

The carriage is of the long, variable recoil type, with hydraulic braking and spring return. The howitzer is made up of two pieces —a nickel-steel tube and a jacket. A collar shrunk on at the forward end of the jacket holds this and the tube in position. The breech block is of the wedge type and opens to the side.

In this connection, the following data are of interest:

Length of bore, 60"; weight of howitzer

and block, 1075 lbs.; limits of elevation, —5°+ 45°; limits of traverse, 3° from center line; weight of howitzer and carriage, 3000 lbs.; same with limber, 4675 lbs.; weight of projectile, 38½ lbs.; weight of explosive charge in shell (lyddite), 6 lbs.; greatest m.v., 1050 fs., and maximum range, 7150 yards.

(NOTE.—The 2.95-inch mountain gun is to all intents and purposes the identical V.M. gun employed in the U. S. Army. For this reason, the last half of this article is omitted.)

Russia

[Captured War Materials. Editorial. *Kriegstech. Zeitschrift,* May-June, '15. 1600 words. Two illustrations.]

One of the most interesting weapons to fall into German hands is the Russian 15 cm. howitzer. This gun is a Schneider product and has only lately been issued to the Russian forces. The fermeture is of the screw-block type, so characteristic of all French designs. The recoil system is hydropneumatic. One peculiarity of the carriage is the prolongation of the cradle for some six calibers to the rear of the breech face. While this increases the difficulty of loading, still it must be admitted that it tends to a steadier operation during recoil. A feature which has been borrowed from German designs is the protection of the recoil clips and guides by means of thin steel plates.

The rear end of the cradle is arranged to engage in stops on the trail, so that all stresses are removed from the elevating mechanism while on the march. On long marches, the howitzer is disengaged from the recoil piston rod and drawn back into a traveling position.

One story that all captured weapons tell, is that the wheels had failed when most needed. This element is the weakest feature of every mobile gun or howitzer. The time to withdraw is not the time to start changing wheels. Many suggestions have been made in this connection, but so far no satisfactory solution has presented itself. There have been wheel shields made and even wheels out of plate. None of these have, however, proven to be practical. One thing is certain, though, the present wheel allowance is not sufficient. If it had been, many of the captured weapons would never have fallen into an enemy's hands.

United States

[The New Field Artillery Arm. Capt. J. Lund, O.D. *Field Artillery Jour.* Jan-Mar, 1915. 2500 words.]

Field Artillery is of ancient origin. When Berthold Schwartz accidentally ignited an explosive mixture in an apothecary's mortar, thereby projecting the stone cover with violence, he produced the first mortar. Use of artillery was at first considered cowardly. During the Revolution the smooth bore was used. The 3.2-in. gun of 1890 was the first all-steel breech loading gun in our service. In 1902 the 3-in. long-recoil, quick-firing gun was introduced.

Of the two requirements, mobility and rapidity of fire, the latter is the more important. The limitations of the 3-in. gun M-02 were: carriages not anchored until after the first shots; limited traverse and elevation preventing use against aeroplanes or rapidly moving targets; line of sight not independent; breech must be open and closed by hand. To overcome these things, the split trail (Deport system) 3-in. gun, model 1913, was introduced. Its ballistics are the same as for the 1902 model; the recoil mechanism is similar to that used on howitzers except that the recoil cylinder is on top of the gun and the springs below. This places the center of gravity of the recoiling mass exactly on the axis of the bore, thus preventing undue stresses and "jump." To anchor the gun, driven spades are used. The split trail permits a 45° traverse and a range elevation of 40°. To combat aeroplanes the gun can be elevated still further (70°). The independent line of sight is used. Elevation corresponding to the angle of site is given to the rocker either by the panoramic sight or by an angle of site index. Elevation corresponding to the range is given to the gun and cradle directly by bringing the range of the range scale opposite the index. In direct laying, gunner lays for direction and site, and No. 1 for range only. In indirect laying, gunner lays for direction only and No. 1 lays for site and range. The panoramic sight need be corrected for difference of level of wheels for the first shot only. To insure stability when on uneven ground, the flasks are connected to the axle and pintle by means of a universal joint permitting one flask to be raised 18° above the other. There is no sight shank to move. The breech is opened automatically and the empty cartridge case ejected on counter recoil. A spring then trips the block and closes the breech when the projectile is inserted.

[Recent Improvements in our Service Artillery Material. By Maj. E. P. O'Hearn, O.D. *Field Artillery Jour.* Jan-Mar, 1915. 4000 words.]

The 3.8-in. howitzer and the 3-in. gun, both models 1913, are of the split trail (Deport) type. Many parts of the carriage are interchangeable. Because howitzers are not adapted to anti-balloon work, the angle of elevation of the 3.8-in. howitzer M-13 is only 40°; that of the gun is much greater. The howitzer has a variable recoil; total traverse is 45°, the same as the 3-in. gun, M-13. Eight batteries of 3.8-in. howitzers have been completed.

Preliminary report from troops on the 3-in. mountain howitzer shows that it is not entirely satisfactory. Demand is made for simplification of matériel, split trail, and more traverse. This is only 6° degrees at present. Present howitzer has a light trail and seats at first shot, thereby making wide traverse unnecessary. Gun and carriage are carried in five packs. 96 rounds per gun are carried, each mule carrying 12 rounds. This is more than with the old matériel.

Promising results are being obtained by having metal spoke shoes attached to the fel-

FIELD ARTILLERY—Continued

loes of wheels. A change from steel to breast collars is in contemplation.

A 7.6-in. siege howitzer and carriage have been designed and are now under construction; for transport it will be divided into two loads each weighing 8000 lbs. The projectile weighs 240 lbs., muzzle velocity 1100 ft. sec.; maximum range at 40° elevation will be 11,000 yds. By using a 190 lb. projectile equipped with a very long, sharp head, the muzzle velocity will be 1350 ft. sec., and maximum range 12,250 yds.

A 9.5-in. siege howitzer and carriage are being designed. The projectile weighs 480 lbs., muzzle velocity 1200 ft. sec. The maximum range at 40° elevation will be 11,000 yds. Greater range will be obtained with a lighter projectile. For transport the system will be sub-divided into five loads, the heaviest about 11,000 lbs.

In order to increase the maximum ranges, lighter projectiles are under consideration for the 4.7-in. gun and the 6-in. howitzer.

A meter base Goerz range finder has been adopted, but on account of the war in Europe they will have to be manufactured in this country. The weight of the instrument is 25 lbs., to be carried on off horse or suspended from the saddle for short distances. The maximum range is 20,000 yds.; power 15; field 2.4°. It has means of measuring angle of site and for quick adjustment. A Goerz scissors observing instrument has also been adopted.

An observation wagon with ladder has been made. The ladder is telescopic, maximum height 25 feet. Ladder can be raised and man up in 3½ minutes; can be collapsed in 3 minutes. With each battery it is proposed to carry two machine gun caissons with 4280 rounds of ammunition. New panoramic sights manufactured have an additional deflection scale; also the head prism may be tilted. Pocket flash lights have been improved to prevent short circuiting.

Several changes in the service bracket fuse-setter are being tested; in one the corrector scale is made more plainly visible; another gives a distinct click for each mil in change of corrector; a third change proposes a single casting for all the parts. New ideas and improvements are also being tested; one by which the projectile cannot be withdrawn unless properly set; another where this is shown by an index; another in which the fuse-setter rotates and the projectile is held fast; and the Greble fuse-setter which performs intricate operations involving new principles. An Ehrhardt fuse-setter possessing all the latest ideas of this company is also under test. Neither a Krupp not a French fuse-setter could be obtained from the manufacturers. The Krupp does not differ materially from the Ehrhardt; the latter is simpler in construction but requires two turns of the crank to set the projectile whereas the Krupp requires only one. New hand fuse-setters permitting a greater corrector change upward are also under way.

New time fuses are twice as strong as the older ones, which sometimes failed to function upon impact due to breakage of the stock. 130,000 rounds of 3-in. high explosive shrapnel (Ehrhardt type) are under manufacture. The Ehrhardt H. E. shrapnel recently tested gave excellent results, but their efficiency as common shrapnel is marred by the relatively low velocity and striking energy of the balls.

The relative efficiency of different types of shrapnel has not been determined in this country. The French claim high explosive shrapnel is not efficient either as shrapnel or as shell. Report has it that the Germans are satisfied with their high explosive shrapnel and that the French are satisfied with their high explosive shell.

Aeroplane bombs tested so far are of two types, the pear shape type, weight 15 lbs., which wobbles in flight, and the cylindrical type, weight 50 and 100 lbs., which is very stable in flight.

Experiments show that there is no appreciable jump of the gun due to certain extraneous causes; lack of coincidence of recoiling mass with axis of bore does however affect jump.

The accuracy life of 3-in. field guns is about 3000 rounds under battle conditions, and the gun will still be fairly serviceable beyond that point.

An anti-aircraft gun firing a projectile weighing 6 lbs. with a muzzle velocity of 2400 ft. sec. has been developed. On account of high velocity difficulty was encountered in securing a good fuse. Order was placed abroad for same, but the war has prevented delivery. In this projectile, the fuse bursts again 75 yds. beyond the first burst, thus giving two bursts, which facilitates ranging.

[Foreign Notes. United States. Reorganization of the Army and of the Field Artillery. *Mem. de Artill.* (Spain), May, '15. 1500 words.]

(This is practically the same data as were given in the *Field Artill. Jour.*, Jan-Mar, '15. See INTERNATIONAL MILITARY DIGEST, June, '15. p. 40, and quarterly issue Sept, '15, p. 120.)

[Improvements in U. S. Artillery Matériel. Editorial. *Artil. Monatshefte*, June, '15. 3500 words.]

(Note.—Extracts from the article by Maj. O'Hern, *Field Artillery Jour.*, Jan-Mar, '15. also INTERNATIONAL MILITARY DIGEST, p. 38, June, '15.)

—Matériel—Mortars and Howitzers

[Development of Curved and High Angle Fire Guns. By Lt. Gen. H. Rohne, German Army. *Artill. Monatshefte*, May, '15. 7200 words.]

The first mortars used fired a 50 lb. stone spherical ball, diameter 28 cm. Later on bomb-shells were introduced. Improvements in metallurgy enabled the range to be increased. This brought about the howitzer, length of tube about 5 to 10 calibers. Length of the cast iron mortar was from 2 to 3 calibers. Eccentric spherical projectiles were then introduced. When fired with the heavy half up, the howitzer approached the gun in range,

whereas with the heavy half down the mortar range was approached. The attempt to improve on this idea was manifested until angles of elevation of 45° were obtained with rifled guns. The first shrapnel used with the howitzer was loaded with stones, pellets, and 1 lb. balls. 21 cm. mortars and 15 cm. howitzers were used by the Germans in the War of 1870-71 with splendid results. After that war, improvements in ordnance made it possible to increase the range of these guns to 6200 m. The failure of the Russian direct fire artillery at Plevna had a great effect on the development of high angle and curved fire guns. The Russian failures were not due to the ineffectiveness of the flat trajectory guns, but to the failure of the artillery to accompany the infantry advance with its fire. To reach infantry behind trenches, Germany introduced the 12 cm. mortars firing shrapnel. France did the same in 1891, with its 120 mm. howitzer, the first recoil field gun. The invention of smokeless powder and of high explosives had a great effect on the development of mortars and howitzers. With their high explosive time shell, the Germans get angles of opening 96° to 114° for the light gun, and of 200° for the light howitzer. Fragments are projected behind the vertical, thus reaching troops under defilade of trenches, but the bursts must be very accurately placed. The time shell of the light gun produces greater effect and covers more danger area than the howitzer or mortar shrapnel. For this reason the Germans delayed in constructing a light howitzer. But when the defilade of trenches was increased and the use of bomb proofs became fixed, it was necessary to introduce the light howitzer. The Germans have found that an angle of fall of 28° is necessary to surely penetrate horizontal cover.

The erection of the long line of heavy fortifications by the French along the German frontier made the Germans develop their heavy mortars and howitzers. They were mobile enough to accompany infantry and needed no platforms. The heavy howitzers and mortars fire only shell, because the Germans have found that shrapnel with high angle fire guns is a waste of ammunition. Other nations have developed their curved fire guns along different lines based on other principles. Most of them fire both shrapnel and shell with their heavy mortars and howitzers using the highest zone only for shrapnel. The great variation in the types of howitzers is due to the vague knowledge of its use. Whereas in Germany in the beginning the principal object was the destruction of targets behind cover, in France it has been the destruction of fortifications. But it was soon seen that troops behind cover were quite safe from howitzer fire. This gun was then used principally to combat hostile artillery, especially the men behind the shields. To accomplish this the French fixed disks to the head of the fuse thus obtaining greater angle of fall with the light gun without varying the powder charge. Shortly after the outbreak of the present war the French found it necessary to introduce light howitzers similar to the German light howitzer.

The modern howitzer has either a constant or a variable recoil. Improvements in sights and fire control instruments have greatly simplified its service. Development of the heavy mortars has wrought great changes in field fortifications. These were recently constructed mostly of armored steel and concrete. But the appearance of the 42 cm. German mortar has made such fortifications useless. These heavy mortars fire with an elevation of 50° to 65°. are usually divided into several loads for motor transport, and must be fired from a concrete platform. Small bomb mortars and coehorns have recently been developed as the result of trench warfare. The anti-balloon gun is also a high angle fire gun in one sense but differs very much from the howitzer and mortar in that it usually has a high velocity and is used against rapidly moving targets in the air.

—Motor Transport

[Armored Cars and Motor Tractors. Editorial. *Field Artillery Jour.*, Jan-Mar, '15. 300 words.]

Tests are being made with motor tractors on the design suggested by Colonel Deport. None can be obtained from abroad so that the Jeffrey Company has made a motor vehicle with a four wheel drive and steer, to which will be fitted armor and a revolving turret in which machine guns will be mounted. Tests will be carried out at the School of Fire, at Fort Sill.

—Observation equipment

[Observation Masts and Ladders. By 1st. Lieut. D. Olmstead, 3d F. A. *Field Artill. Jour.* Jan.-Mar., 1915. 700 words.]

Observation ladders are necessary for light artillery. They can be improvised, as shown by types in 2d Bn. 3d F. A. One type weighs 120 lbs., consists of two sections standing 25 ft. high, with projecting rods for steps. On top is a detachable seat and crossbar for B. C. telescope. It is anchored by guy ropes, and can be erected either on the caisson or on the ground. Can be erected in about 2 minutes. Another type consists of a three-section extension wooden ladder, standing 24 ft.; weight, 125 lbs. Two sets of guys are used. Can be used as a step-ladder or as a stretcher. Can be erected in 2½ minutes.

[Field Artillery Observation Devices. *Army and Navy Register.* May 1, 1915. 360 words.]

The "Fontanamast" a telescoping ladder of German invention has been found unsuitable for the service. The field Artillery Board is testing an observation ladder to be attached to a 3-inch field gun caisson. Of sliding and folding type, this ladder is provided with a shield, an observer's seat, and a support for the instrument.

—Organization

[Foreign Field Artillery Organization. By Capt. Dan. T. Moore, U. S. Field Artill. *Army & Navy Jour.*, Aug 28, '15. 1800 words.]

The organization of the Field Artillery of the belligerents is given in some detail. Ger-

FIELD ARTILLERY—Continued

many shows 18 field and 10 howitzer batteries to the corps, or 6.1 guns per 1000 rifles. The war strength of batteries is 230 (field) and 270 (howitzer). 432 rounds of ammunition per gun are carried with the battery and in the ammunition columns for the heavy howitzers.

Austria has 8 field and 6 howitzer batteries per corps, or 3 guns per 1,000 rifles.

France has 36 field batteries per corps, or 4.66 guns per 1000 rifles. These are all 75 mm. guns, and the batteries are assigned 18 divisional, 12 corps and 6 reserve brigade artillery. It was also proposed to assign two howitzer batteries (two guns each) to each corps, but it is not known whether this was actually done. A great but unknown number of light field howitzers, heavy field guns, and heavy field howitzers have been sent to the front since the war began.

Russia has 12 field batteries (8 guns each) and 2 howitzers to the corps, or 3.3 guns per 1000 rifles. All the active organizations were equipped with light field howitzers by 1913. Type heavy field guns and howitzers have been adopted and issued to troops.

Italy has 16 field batteries and 2 howitzer batteries to the corps, or 4 guns per 1000 rifles. It is believed that the Deport guns have been issued to all active organizations. A law of Jan. 3, 1915, fixes the strength of the Italian Artillery at 294 batteries (1176 guns).

England has 9 field batteries, 3 howitzer batteries, and 1 heavy gun (60 lb.) battery to a division, or 4.2 guns to 1000 rifles.

With the cavalry units, the proportion of guns per 1000 sabres is: Germany, 3.3; Austria, 3.3; Russia, 3.3; Italy, 2.7; England, 1.33.

This information is from a German source and agrees with reports from England.

All the nations at war are using every gun available, regardless of type. All they seem to want is guns.

United States

[Our Approved Project for Field Artillery Material and Ammunition and Status of its Execution. By Major E. P. O'Hearn, O.D. *Field Artillery Jour.* Jan.-Mar., 1915. 3500 words.]

This project was recommended by a board of Field Artillery and Ordnance officers. It is based upon the assumption that the U. S., in case of war with a first-class power, would have to raise *at once* a mobile force of 450,000 men within the continental limits of the U. S. As a basis for the organization of the Field Artillery, a type Field Army (3 divisions with one auxiliary division) was selected. The number of guns per division was fixed at 48, while for auxiliary divisions it was 8 guns per division, giving a total of 168 guns for a Field Army.

In the type Field Army each of the first two divisions will have two regiments of Field Artillery, three battalions being equipped with 3-inch guns and the fourth battalion with 3.8-inch howitzers. The third division of the field army will have two regiments, three battalions being equipped with 3-inch guns, and the fourth with 4.7-inch howitzers. The auxiliary division will have one regiment of three battalions of two batteries each of 6-inch howitzers, 4.7-inch guns and 4.7-inch howitzers.

Cavalry division is to be provided with a regiment of six batteries equipped with 3-inch guns.

Provision is also made for field artillery in the insular possessions as follows: Philippines—three light batteries, three mountain batteries; Hawaii—six light batteries; Panama—three light batteries.

The 450,000 men would be organized into six Field Armies and two Cavalry Divisions. Two Divisions out of the eighteen will be equipped with mountain howitzers.

The total cost of this project, excluding ammunition, is 41 million dollars. Half of this amount has been provided to date. When completed the field artillery will comprise 54 regiments with 1292 guns.

The project then takes up the question of ammunition, fixing the supply required on wheels or packs, in advance supply depots and at the base or in arsenals. The grand total of ammunition required is 1,713,240 rounds; its cost is approximately 24 million dollars, of which amount about one-third has been provided. There is still on hand 62,000 rounds for the 2.95 mountain, 5-inch siege gun and 7-inch howitzer. The output of Frankfort arsenal will shortly be increased to 1500 rounds per day. The monthly capacity of all government and private plants is 120,000 shrapnel and 45,000 shell. Other plants are about to take up the work and thus increase the output. It would take a year to manufacture the rounds needed to supply the 1292 guns of the first line of defense. The most serious factor is the small initial supply and the time that would elapse before deliveries in large quantities could be made.

The percentage of shell and shrapnel for the different kinds of guns is also fixed by the project.

—Range

[Range of a Quick-Firing Gun. *Arms and the Man*, Aug. 5, '15.]

A high degree of perfection has been reached by the quick-firers in the present war. The favorite method of getting the range has been by trial shots observed from an aeroplane, from which corrections are made.

The American 3-inch quick firing gun has an effective range of 6000 yards, with initial velocity 1700 f.s., and reaches the target at this range in 19.36 seconds. Shrapnel sends the bullets at velocity of 250 to 300 f.s. plus 740 f.s., remaining velocity of the shell on explosion, with a beaten zone of 30 to 250 yards, half the bullets falling on the first 50 yards of the zone. Time fuse, with fine graduations, seems to be preferred to percussion fuse.

[Maximum Range of High Angle Fire. By Major J. F. R. N. Maitland-Addison, R.A. *Jour. Royal Artillery,* Aug, '15. 600 words. 1 table.]

Statements are frequently being made as to the maximum possible range that can be obtained with a gun. The table with this

article has been compiled with a view to enabling one to obtain the maximum range of any gun with a minimum of computation, also the maximum height of trajectory, and the time of flight when fired at an angle of elevation of 45°.

The table is constructed using C—the ballistic coefficient—and V—the muzzle velocity—as arguments, and therefore is applicable to any gun when the ballistic coefficient is known. —Range Finding

[Concerning the Position in Observation. Lt. Gen. H. Rohne. German Army. *Artilleristische Monatshefte*. Feb 15. 2500 words.]

In discussing preparation of fire, the German regulations start out with the supposition that the targets are already known, the French regulations that their location is unknown. For this reason the French describe in great detail the measures to be taken in preparing for a position in observation. Each battery is given a sector and a principal reference point. The Germans prefer to lay originally for parallel fire; the French always open the sheaf slightly. The Germans prefer the method by using the aiming circle as an aiming point because it is less complicated though slower than using a distant aiming point. The difficulties encountered in using an aiming point are circumvented by placing the B.C. station near the battery; by using an aiming point at least 1000 m. distant; by measuring the distance to the aiming point; and by using a parallax table. The battery is laid originally on the reference point. The minimum range to clear the crest is then determined. If time is available, all the prominent points in the sector are registered and recorded. Should a target appear, its angular distance from the reference point is quickly measured and the battery may then at once open fire approximately correct for deflection and range.

To obtain proficiency in the position in observation, frequent practice in determining firing data is necessary. For this purpose, work with skeleton details is excellent. Many officers returning from the front have expressed the opinion that the French must have very accurate range finders because they obtain adjustment so quickly. But as is well known, their range finder is if anything inferior to ours. Their proficiency is due only to frequent practice in occupying positions in observation and in the use of their instruments. If the method is mastered, all use of tables and calculations is unnecessary. There is only one caution—avoid crossing the fire of the guns. Rapidity is important, and to this end certain small errors may be taken into the bargain. The more distant the aiming point and the nearer on the flank of the battery its location, the smaller will be the error.

[An Apparatus for the Practice of Observation of Fire. By Capt. H. R. Thomas, R.G.A. *Journal of the Royal Artillery*. Mar., 1915. 1800 words, two photographs, one drawing.]

For practice of observation in time shrapnel ranging by detachments of the R.G.A. on the transport voyage from the Far East, an apparatus was designed and constructed. A part of the side of a box was removed and a sand landscape arranged therein. To indicate point of burst, a pin was supported on a three motion apparatus. The range motion was by a bar, the position of which was determined by notches cut in the edges of the sides of the box, the successive notches representing differences of 25 yards in the range. The azimuth was represented by readings of a carrier sliding on the bar. A double vertical slide working in the carrier allowed adjustment of the pin head in height for corrections, as well as for position of target. The whole apparatus was constructed on a scale of two inches to 100 yards, and graduations of scales worked out to correspond. The bar could be tilted backward and all orders of the B.C. for settings carried out. Then the bar was thrown forward, bringing the pin head in the relation to the indicated target that resulted from such orders, thus showing the point of burst. The B.C. sat in his proper relation in scale to the apparatus. An improvement suggested but not carried out was to make the slide motion of the corrector approximately parallel to the angle of fall, so that corrector changes would have their proper effect in range as well. The apparatus did not afford practice in correcting for errors in setting or burning of fuzes or in laying the gun, but it gave a good range of practical exercises.

[Correction of Deflection for Indirect Fire of Field Artillery, when the observing station is distant from the guns. Maj. Angelo Marolda, Italian Artillery. *Rivista di Artiglieria e Genio,* Apr '15. 2000 words. 2 diags.]

When the observing station is distant from the guns, adjustment becomes complicated. A shot that appears directly in front of the target is actually to one side; to get an observable over it may be necessary to throw the next shot to the other side. It is here sought to deduce an approximate rule for the amount of deflection change.

Taking as a basis a range of 1000 m., and the actual direction of the target from the observing station, calculate the angle in mils subtended at this assumed target by the line gun—observer—that is GO-1000, corrected for obliquity. Using this constant for any target in that direction, it is found that a range change of 100 m. requires the following deflection changes, approximately: for a range of 1000 m., 8 times the constant; 1500 m., 3 times the constant; 2000 m., twice the constant; greater ranges, the constant itself.

[The Single Observation Range Finder. By Capt. L. J. McNair, 4th F. A. *Field Artillery Jour.*, Apr.-June, '15. 8500 words. Figures and tables.]

(Note.—A technical discussion of special interest chiefly to field artillerymen, but should also be of interest to the other branches.)

FIELD ARTILLERY—Continued

The single observation, self-contained range finder is a notable achievement in optical instruments for field artillery use. The Goerz meter base range finder (see *F. A. Journal*, Jan.-Mar., 1915, and *Int. Mil. Dig.*, July, 1915) has been adopted by both the U. S. Field Artillery and Infantry as a result of independent tests made in 1912. The discussion of its effect upon field artillery fire is based upon accomplished results in actual firing covering 340 problems at the School of Fire, during which the Goerz 15 power and the Zeiss 10 power range finders were used, the former instrument showing greater accuracy due to its greater power. The description of the Goerz instrument, its construction and use was given in the *F. A. Journal*, Jan.-Mar., 1915, and *Int. Mil. Digest*, July, 1915. Three methods of adjustment are available, of which the artificial infinity method, by using an adjusting bar, is the best. It is a fact that the gun is after all the best range finder. This does not warrant its use in adjusting an instrument of this class because, although it is possible to adjust the instrument for a known gun range of a target, it is impossible to obtain correct gun ranges for targets at other ranges or on other occasions or under other conditions such as higher altitudes or different atmospheric conditions. The range finder should greatly increase the efficiency of a battery, but to obtain results the operators of the instrument must be selected and thoroughly trained. All officers should also be skilled in its use. Training should include instruction in care and adjustment and finding the ranges of stationary and moving targets. In preliminary instruction coincidences of the images are made and verified. Ranges are then found to widely varying points, the distances to which are known by triangulation. Results should always be checked. Even good operators become careless unless supervised and checked. Preliminary work with moving targets may be had by causing mounted men to pass over predetermined routes and points the distance to which are known by triangulation. Rough usage in the field and during transportation have caused internal disorders in the instrument necessitating repairs. A mounted man may carry the instrument on his saddle for short distances. A pack saddle has also been suggested but it is believed that a suitable spring box on one of the carriages is the best solution.

The range finder will never obviate the necessity of firing for adjustment or alter the correctness of the bracketing principle. Only one thing can be expected, that by its use the first range will generally be nearer the target than if the range were estimated, and as a result the initial bracket may be reduced, thus saving time and ammunition and permitting fire for effect to be opened much sooner. The object therefore is to determine this appropriate range change for all ranges and for moving as well as stationary targets. To determine this, we must know the proximity of the center of impact of the first range used to the target as determined by the range finder. This error of the range center of the first range used is made up of two independent component errors: (a) the error of range finding, called the *range finding error;* (b) the error of the range center or the amount which the gun fails to shoot true to the range at which laid, called the *error of the range center.*

From tabulated data covering 340 firing problems with firing varying between ranges 1000 to 4500 yards, it has been determined that the manufacturer's figures of accuracy can not be accepted because they do not introduce errors commonly met under service conditions, such as faulty adjustment and unskilled observers. It has been determined though that the law of errors does apply and that the calculated and the actual errors approximately agree. The probable *range finding error* was 84 yds at 2000, 100 yds. at 3000, and 119 yds. at 4000 yds. range.

From tabulated data covering 181 firing problems, with ranges varying between 1000 and 4000 yds, the probable *error of the range center* has also been determined for different groups of ranges. The results obtained although not strictly correct are sufficiently accurate for discussion, as an inspection of any particular group will show. The probable *error of the range center* was 47 yds. at 2000, 69 yds. at 3000, and 91 yds. at 4000 yds. range.

Since the *range finding error* and the *error of the range center* both follow the law of errors, the probable distance of the first range from the target may be evaluated, being the square root of the sum of the squares of the component errors or at 2000 yds. it is $\sqrt{84^2+47^2}=96$ yards, at 4000 yds. it is $\sqrt{119^2+91^2}=150$ yards.

To check the accuracy of these values, the school target reports in which the range finder was used have been examined and the error of the first range corrected for height of burst tabulated under the following groups: Group 1, all moving targets, direct laying mean range, 2500 yards; Group 2, stationary targets such as batteries and machine guns, using indirect laying below 3000 yds. mean range 2500; Group 3, same as Group 2 except between 3000 and 4000 yds., mean range 3400; Group 4, same as Group 2 except ranges over 4000 yds., mean range 4300 yds. The small difference between the actual and calculated results can be definitely explained. The target report values show that the calculated values are conservative, and that the law of errors applies to the distance of the range center of the first range. This probable error is at 2000 yds. direct laying $\sqrt{84^2+47^2}=96$ yds. at 2000 yds., indirect laying $\sqrt{84^2+47^2+68^2}=118$ yds., at 4000 yds. indirect laying $\sqrt{119^2+91^2+48^2}=157$ yds.

Knowing the relative frequency of the various positions of the range center of the first range used, the number of ranges that must be used to bracket the target with each of the different range changes may be computed. The table shows that there is no support for a 400 yd. bracket, that a 50 yd. bracket will necessitate an excessive number of ranges involving a waste of ammunition; that

as between the 100 and 200 yd. bracket, it will be seen that the amount of ammunition used is the same, but that the 100 yd. bracket is more economical at short range and the 200 yd. at longer ranges. For general practice the 200 yd. bracket is preferable.

The attack of moving targets is materially influenced by the use of the range finder. There is, however, nothing to show that there is any marked difference in the accuracy of range finding in the cases of fixed and moving targets: The element of time is very important in the attack of moving targets. The average time during which such targets are exposed at the school is 91 seconds, of which 15 seconds are consumed in preparing for fire and 76 seconds in actual firing. Three methods of attacking a moving target are considered. (a) Fire for effect without ranging or bracketing, (b) fire for effect after observing the first range, (c) fire for effect after observing a bracket.

The first method is undesirable because the fire is begun at a range where the target is least likely to be, and the probable range of the target is not fixed until fire is almost completed. The second method is good except in cases of very rapidly moving targets. The first range is almost always within 400 yds. of the target. Fire for effect should therefore be begun almost immediately after the first range is observed by starting at the appropriate limit of the assumed 400 yd. bracket. The third method, while sure, involves a waste of time and ammunition because the second range observed is almost always the other limit of the bracket. In any case the B. C. is justified in waiting for the range announced by the range finder.

For slowly moving targets, a 200-yd. bracket should be sought and the same principles applied as for fixed targets.

The following conclusions are emphasized and should be incorporated in our regulations:

1. The range-finder is a delicate instrument and should be handled and transported as such.

2. Great importance should be attached to training of the operators. Accuracy is the first essential, then speed. A range not reliably found must be so recognized and this fact at once honestly reported to the B. C.

3. (a) Against fixed targets use a change of 200 yds. until a bracket or effective range is obtained. (b) Against moving targets, wait for the range finder range or for a report that it cannot be obtained. Open fire at the range finder range, and after observing this range assume a 400 yd. bracket has been obtained and fire for effect beginning at the appropriate limit. In the case of a very rapidly advancing or retreating target, the assumed bracket may best be taken as 500 yds. when the first range is observed in the sense *away* from which the target is moving.

4. Authority should be given to give these principles a further test and practical trial in the service.

See also
FIELD ARTILLERY—FIRE CONTROL
FIELD ARTILLERY—OBSERVATION EQUIPMENT
GOERZ RANGE FINDER

—Small Caliber Ordnance

[Organization of 7 cm. 5/45 CTR Batteries. By Ricardo Amaral, Lieut. of Artillery. *Revista de Artilharia,* May-June, '15. 3000 words.]

In defense, small caliber secondary batteries reduce the support necessary to a minimum. Used in connection with large caliber guns, they furnish in themselves the necessary support. They require small protection, and at the same time can deliver a heavy volume of fire. In defensive operations, large caliber guns depend for their existence upon these secondary batteries.

It has come to be recognized that the key to all military operations of importance is the artillery. As sea battles are won by the accuracy and volume of artillery fire, so also are land battles of to-day.

The 7 cm. 5/45 CTR batteries furnish the best organization and the maximum density of fire. Their effectiveness, however, is controlled or influenced by characteristics of material, distribution of pieces in works, organization of the service of munitions, garrison instruction, organization of the service of fire, and the processes of fire employed.

The 7 cm. 5/45 CTR gun has a maximum rate of fire of fifteen shots per minute. On special missions, these guns can perform service that would be impossible for guns of large caliber. "The secondary batteries of defense are capable of delivering a dense and continuous fire, and they are almost automatic in preparation of fire."

—Small velocity ordnance

[Small Velocity Ordnance and Parabolic Trajectories. *Arms and Explosives.* Jan., 1915. 1200 words, tables and formulas.]

Among artillery features of the war, the Krupp trench howitzer, "Minenwerfer," appeals to the imagination. Weighing only 120 lbs. in transportation, and readily handled by a couple of men, this "gun" throws a spherical shell 16 inches in diameter, weighing 200 lbs. and carrying a bursting charge of 86 lbs. of trotyl. As its caliber is only 2.1 inch, a stem or rod slips into the bore, and projecting 8 inches beyond the muzzle supports the bomb, which is for the purpose bored to the center. The ballistics of the projectile is simple; since the air resistance is low, parabolic formulæ apply, and the resulting tables involve merely the use of a little arithmetic. At an angle of projection of 45 degrees and muzzle velocity of 200 f.s., the range of the projectile=1244 ft; the time of flight=8.8 seconds, and the maximum ordinate=311 feet. The Hall rifle grenade, with a muzzle velocity of 138 f.s., accomplishes a range of 450 feet in 7/8 seconds.

—Tactics

[Notes on Field Artillery Tactics and Fire. By G. Strazzeri, Colonel of Artillery. *Rivista di Artiglieria e Genio,* Feb, '15. 2500 words.]

FIELD ARTILLERY—Continued

Field artillery in the present war has assumed greater importance than ever before. The experience now being gained may bring about modifications in methods of using it; but it will be years before the facts can be thoroughly known, and we must now base our studies on existing regulations.

Flash defilade gives a battery almost a certainty of being able to remain in action a long time, especially if protection is constructed for the guns. Such positions exist almost everywhere; the question is how to find and occupy them. Commanders of all grades, with the assistance of their staff officers and scouts, must constantly study the ground while on the march; the old method of a short gallop to the front and a brief reconnaissance will no longer serve.

Since the enemy also will conceal his guns, great skill will be necessary to find them. Here also the scouts come in. The French, in particular, seem to be showing themselves masters in this work.

Tactical maneuver is not necessarily more difficult in war than in peace, but conduct of fire is much more so. Firing instruction, therefore, should stand first in our programs. A few important points may be mentioned here.

Time fire is of primary importance in field guns. Correct height of burst is essential in making this fire effective, and this element is often misjudged. It is suggested that in elementary firing exercises heights of burst be measured instrumentally and called off at once, to give all observers a check on their estimates.

Modern warfare is mostly in trenches. The best way to reach troops in trenches is by time fire; but the burst must be precisely right. This should be practiced in firing exercises.

Firing at successive ranges is easier than using a single range, and very often it is the only practicable way. But it should be remembered that it is less effective, and a single range should be used whenever it is found practicable.

[Cooperation of Artillery in Combat. *Revista Militar,* Mar '15. 1500 words.]

The principal mission of field artillery is to efficiently support the infantry. These arms are inseparable in battle both as to time and as to space. Their training should therefore be side by side. It is simple enough for the Field Service Regulations to tell us that the Field Artillery must maintain constant communication with the first line of Infantry by means of special officers but only constant training of Infantry and Field Artillery side by side in field firing will give the skill and practice necessary to achieve these apparently simple maxims in battle under the extremely difficult modern conditions.

Numerous examples from the Manchurian and Balkan wars show the disasters which come from the lack of close cooperation between Infantry and Field Artillery which only constant joint field training can remedy.

[Artillery Positions. By Maj. B. Payne, 6th F. A. *Field Artillery Jour.,* Apr.-June, '15. 2000 words.]

The selection of an artillery position should be determined by a consideration of the task in connection with the topographic features of the terrain. Too much importance should not be attached to the concealment and the protection offered by *natural* masks. The selection of the B. C. station should be determined by the mission. A perfect position to suit a particular task is difficult to find. Concealment does not mean that the guns must be posted far in rear of a covering crest, the advantage of which should not be overestimated. The advantages offered by concealment are surprise and mobility. Positions should be sufficiently defiladed to prevent registration of fire. The Russians state that artillery can not go into position under fire of machine guns at less than 1800 yds. Under such circumstances machine guns should be opposed to machine guns. Artillery must always be able to support its infantry. The necessity for intrenching artillery is greater than ever. Many cases may arise necessitating a position in the open. Opinions differ concerning the location of the B. C. station with respect to the guns. Some say it should be as close to the guns as possible. Others fix the condition that as much as possible of the hostile sector must be observed.

There is no such thing as *natural cover* but there is such a thing as *natural concealment* which must be augmented by artificial concealment and night occupations. Always seek concealment but never at the expense of freedom of action. The execution of a task is influenced by our judgment in the selection of the position.

[The Employment of Artillery in the Balkan and in the Present European War. By 2d Lieut. N. P. Morrow, 4th F. A. *Field Artillery Jour.,* Apr.-June, '15. 9000 words.]

(*a*) BALKAN WAR

The artillery of the Balkan Allies was superior to that of the Turks. The former's success led to bitter discussions as to the relative merits of the French and German artillery, but the Allies' superiority was due to superior training, organization and *esprit* alone. The Turkish artillery was ignorant of indirect fire methods and rarely made use of masked positions. Occupation of and withdrawal from position was poor. The Turks considered the artillery duel as unnecessary and consequently were annihilated and failed to give their infantry proper support, except at Tchataldja, where they repulsed the Allies with great loss. The Turks lost many guns. Due to crude methods in setting fuses their shrapnel fire was ineffective. Both sides used common shell and shrapnel only.

The Bulgarians and the Servians made good use of masked positions. The Servians had trained twice as many drivers and horses as the Bulgarians and always got up to close ranges to support the infantry which the Bulgarians frequently failed to do. The Greek ar-

tillery played only a small part in the war, but was well handled. The fire of the Servian artillery was more effective than that of the Bulgarians.

At Adrianople the Turks failed to offer the maximum defense, though adequately supplied with ammunition. The Bulgarians made careful preparations, had accurate information, and kept the Turks in the dark as to the real point of attack. Several conclusions seem warranted by the results of this war. Well adjusted artillery fire can stop the fire of another battery whether shielded or not; in a duel between a concealed battery and one in the open, the former will win; a battery seen or caught in motion is a battery lost; a duel between two concealed batteries is useless. Guns must frequently be moved by hand at night, necessitating drag ropes. Frontal fire, even at ranges of 2200 yds. against infantry is not decisive; flanking or oblique fire is required. Heavy artillery plays an important role, and the failure at Tchataldja is ascribed to its absence.

(*b*) EUROPEAN WAR

It is impossible to come to any definite conclusions at present as to the proper use of artillery under modern conditions. The heavy artillery of the Teutonic Allies has given them a marked advantage. The German light field gun is considered inferior to the French 75 mm. gun. The existence of the German 42 cm. howitzer has been established. The effect of the heavy artillery on the fortifications of Liége, Namur and Maubeuge was terrific, concrete cupolas and turrets being overturned and the defenders asphyxiated by the gases of explosion. The days of fortress warfare are past.

To escape the effect of the heavy artillery fire, infantry always intrench themselves, preferably on the reverse slopes. The long range of these heavy guns and the success of aeroplane reconnaissance have revolutionized the old systems of observation and communications. Advance observers at great distances from the batteries are frequently used. In their drive on Paris the Germans used their light artillery boldly, making constant use of hastily constructed entrenchments. The destructive effect of the French high explosive shell has compelled the Germans to seek masked positions from 500 to 800 yds. behind the crest. Guns are always dug in to escape aerial observation, and are frequently shifted from one position to another one already prepared. On the western front, the German light howitzer has shown a marked superiority. Other successful types of guns are the "Minenwerfer" and the anti-aircraft guns mounted on motor trucks. The Allies claim that they have now reached an equality in guns with the Germans. The Germans underestimated the powers of the Russian artillery. The Russians have shown themselves masters in the use of terrain and the construction of cover and entrenchment for artillery. The Russians placed their observation stations at a considerable distance from the guns. Their reconnaissance of the hostile front was thorough and a very comprehensive system for collecting and disseminating information was organized. The Russians were guilty of needlessly wasting their ammunition.

The beginning of the war found the French woefully deficient in heavy artillery, due to over confidence in the 75 mm. gun. This deficiency has been corrected. At the battle of the Marne the French averaged 600 rounds per gun. Their most successful projectile has been the high explosive shell, which has great destructive effect. The French invariably used the masked position and the Germans failed to search far enough behind the crest. Telephone troubles have been frequent. With modern fire control equipment, the French battalion commander usually succeeded in maintaining control of his units though they were widely separated.

The English advocate the use of heavy artillery. They make constant use of masked positions far behind crests and pay particular attention to screening from aero-reconnaissance. Visual signaling has been found impracticable and most often communication is by buzzer.

It seems that everywhere the use of observation ladders has been discarded and the advanced observer substituted therefor. Intercommunication between the artillery and infantry is obtained by detailing special officers for this duty.

Before drawing any conclusions for our own use, we must keep in mind the peculiar conditions in the present theater of operations on the West front. The following facts seem to be substantiated: our present proportion of shell to shrapnel is too low; in the future artillery will fire at longer ranges; perfect coordination between the infantry and the field artillery is absolutely necessary; batteries must conceal themselves also from aerial observation; aeroplanes must co-operate with field artillery; the use of advanced observers necessitates greater perfection in our system of communications, which should be by buzzer or telephone.

[Notes on Field Artillery. From Army Service Schools, Ft. Leavenworth, Kan. *Field Artillery Jour.*, Apr.-June, '15. 6000 words.]

(Note.—Of interest to officers of other arms because it touches on the tactical handling of Field Artillery.)

The United States is the only country to maintain full strength batteries in time of peace. All other nations skeletonize the firing battery for training purposes, impress teams for ammunition supply, and maintain reserves. Howitzers enable a division to act independently. The tactical artillery unit is the battalion. The Germans with 6.4 guns have the highest percentage per 1000 rifles; the United States with 3.1 the lowest. Artillery can easily keep up with the troops it accompanies. In advancing to position it usually moves at the trot, in occupying position at the walk or trot. It seldom moves at the gallop, but when circumstances require, it gallops in line for short distances only. Average march for a battery is 15 to 20 miles per day.

FIELD ARTILLERY—Continued

The statement that a battery seen is a battery lost still holds true. In the Balkan wars, the Bulgarians relied upon long distance firing. The Serbians usually tried to get within 2000 yards. At Yenidze-Yardar, the Turks held up two Greek divisions by covering a bridge at 6800 yards. As a rule, rather than cross exposed areas, extreme ranges were used or darkness was awaited. In order to be able to deliver an effective fire, the artillery must take its chance and not be afraid to suffer losses. On the march, artillery must be placed with a view to security and availability. Artillery is usually not assigned to the advance guard of a force smaller than a brigade. It is not the size but the mission of the command that should determine the strength in artillery. A pursuit will soon resolve itself into attacks on well-defined positions which the retreating force defends to cover the assembly of its march columns on the roads. A retreating force which adheres to roads will outdistance a pursuing force advancing across country.

Firing practice and exercises in time of peace have the fault of inculcating false ideas concerning the kinds of positions which artillery should occupy. Two essential conditions are that the position be within range of the enemy and that it be possible to lay upon him. Mountain artillery is especially suited to accompany the infantry line. In considering a position, protection is secondary to ability to deliver effective fire. Advantages of positions behind the crest are, greater mobility, ability to act by surprise, greater field of fire, hostile observation made more difficult, ammunition supply easier.

A battery occupies a front of 100 yds., a battalion 400 yds., a regiment 900 yds. Light guns are rarely placed in tiers. With howitzers or heavy guns in the second line this may be done. Firing over infantry must be considered as the normal procedure and is not dangerous. The best position for the artillery in supporting the infantry is 100 yds. in rear of the infantry line, in which case the artillery can support the infantry up to 200 yds. from the hostile trenches, and on the defense until the hostile attack arrives within charging distance. In offensive action, the necessity of getting within suitable and effective range of the hostile positions will usually govern.

[Employment of Artillery. France. *Revista de Artilharia,* July, '15. 250 words.]

Before the present war had taught its lessons, the French Government published rules for the employment of artillery. The fundamental principles of the employment of Field Artillery may be put into twelve simple rules:

1. Seek covered positions. 2. If a battery is compelled to take an unprotected position, it must be under the protection of another battery. 3. Add strength to the position by getting into action before the enemy. 4. A change of position during combat should be undertaken only if there is promise of a great and well-defined advantage. 5. Batteries will deliver fire only when circumstances make it necessary. 6. Fire against concealed target will be that most frequently employed. 7. Given proper protection, the artillery duel cannot be decisive 8. Flank fire produces the maximum effect. 9. The character of the fire will be determined by the circumstances. 10. Of greatest importance is the consumption of ammunition. 11. Fire over other troops is necessary—sometimes over lines of infantry and sometimes over other artillery. 12. Artillery, whether in position or on the march, requires the protection of other arms.

See also
ENTRENCHMENTS—TACTICS

—Use of in European War

[European Field Artillery Material and Developments of the Present War. By Maj. E. P. O'Hearn, O. D. *Field Artillery Jour.* Jan.-Mar., 1915. 4000 words.]

All European countries have a long recoil light field gun, firing about a 15-lb. projectile. French and Belgians use high explosive shell with thin walls and large bursting charge of melinite. Shells for 75 mm. gun contains 16 per cent, and for 6-inch howitzer 30 per cent of explosive. The proportion of shell, which was small formerly, is now 50 per cent. German and English shell have thick walls and smaller bursting charges; the Germans use trinitrotoluol, the English use lyddite. The Germans have two types of shell for larger guns, one containing 4 per cent high explosive, the other 20 per cent.

A German Corps, 45,000 men, has 18 batteries (108) light field guns, six batteries (36) light field howitzers, and six batteries (24) heavy howitzers. In addition, Army headquarters has available 24 8.3-inch mortars and 24 heavy 6-inch guns. An Army comprising two Corps would therefore have 384 guns. Six-inch howitzers have been found very useful; intrenched troops pay little attention to shrapnel fire. Beams of searchlights are concentrated in the faces of the defenders, whereupon the advance is made in the dark sectors. The French Heavy Artillery was inadequate in the beginning of the war. To obtain greater angles of fall, a disk was attached to the shrapnel of the French light gun. This is a poor substitute for howitzer fire.

The Germans used very heavy artillery at Namur. The 21 cm. mortar caused the greatest destruction. The Krupp 11-inch howitzer fires three weights of projectiles weighing 450 to 770 lbs.; maximum range, 12,000 yds The armament of the British Artillery can be obtained from their manual.

The forts surrounding Liége and Namur were all of the same general construction, being a heavy concrete mass from which rise five or six small cupola turrets containing the guns. Their construction showed many weaknesses when subjected to the fire of the German siege artillery. The German plan of attack was to reduce two of the forts by siege artillery, move into the city and then attack the rest of the forts from the rear; the main body in the meantime passed on to continue the campaign.

Germans are said not to take sufficient defilade, but they mass the fire of their guns quickly and do not mind losing guns if they can save men thereby. The French take large defilade and have not suffered much, because the Germans do not search sufficiently behind the crest.

During the battles on the Marne, the French expended an average of 600 rounds per gun per day for four days, the total expenditure being 400,000 rounds. The German heavy howitzer has an advantage in range over the French heavy howitzer. The French retreat toward Paris continued night and day, and was very hard on men and horses. Aeroplanes are constantly used in artillery reconnaissance and in directing fire. Aero scouts must fly at about 5000 feet to be reasonably safe. Observations are signalled by means of flash pistols. Aero scouts want high-speed planes. Batteries prepare several positions for occupation in order to mislead aviators.

[Austrian Artillery in the Present Campaign. Anonymous. *The Sphere,* Mar 20, 1915. 1000 words, Illus.]

The Austrian field gun is a 3-in., 15 pounder quickfirer, with shield, and weighs 3750 pounds with loaded limber. The gun is made of bronze, about equal to the German field gun, but inferior to that of the other belligerents. The mountain gun was a 7 c. m. bronze gun firing a 10 lb. shell. The Austrians were rearming with a 4.1 inch quickfiring mountain howitzer, firing a 30 lb. shell, range 6500 yards. The rearmament was probably complete in 1914. The bulk of the mountain artillery was assigned to three corps (14th, 15th, and 16th) though there were one or two batteries with the others.

The heavy artillery of Austria was good. Some of the huge mortars (probably 12 inch) used against Liége and Namur were Austrian. Of these Austria is believed to have possessed 34. They fire a shell weighing 800 to 1000 lbs., and have a maximum range of 10,500 yards.

The heavy field artillery comprised 4.1 inch guns and howitzers. The Germans were very strong in heavy artillery. The French and Russian field guns are similar and the British gun is about of the same class. The Russian field gun has a muzzle velocity of 1930 f. s. All the others have a velocity of 1600-1700 f. s.

[The Field Artillery of the Belligerent Powers. By Maj. B. Schmidt-Roeder, German Army, ret. (Marsyas.) *Artill. Monatshefte,* Mar '15. 3000 words. 3 tables.]

(Note.—The technical information concerning the field artillery armament of the different powers is all shown in statistical form in the tables accompanying the article.)

Light Field Guns.—The English 76 mm. gun has the shortest length in calibers. The German 77 mm. gun has the lowest initial velocity and the smallest weight of gun and carriage. The French gun has the longest length in calibers and is also heaviest in weight. The Russian gun has the highest initial velocity. All nations use hydraulic oil and spring counter recoil, except the French, who use oil and compressed air. All guns traverse about a cradle pintle except the French gun which traverses along the axle. Shell and shrapnel usually weigh the same except for the French shell which is 4.4 lbs. lighter than its shrapnel. At the outbreak of the war no nation had as yet introduced a projectile for light guns. The German and Austrian shrapnel bullets are quite light weighing 10g and 9g, whereas those of the Allies are much heavier, weighing 13 to 15g. The Japanese Krupp gun strikes the best average in every respect. The guns are all built up except the English gun which is wire wound, thus accounting for its short length in calibers.

Field Howitzers.—Belgium, England and Japan have only light howitzers; Franch only heavy howitzers. As a substitute for the light howitzer, France uses the Malandrin disc attached to the head of its light gun projectile. Only in recent years has the principle of a fixed carriage with a uniform or a variable recoil been applied to howitzers.

Light Field Howitzers.—The caliber varies between 95 and 121 mm. The Germans have a unit projectile. The Austrian light howitzer is not a long recoil gun. In the Russian howitzer, the recoil is of uniform length whereas in the English howitzer it is variable.

Heavy Field Howitzers.—The German howitzer surpasses all the others for adaptability in the field. The French 155 mm. Rimailho howitzer is a long recoil gun, the piece and carriage being separated into two loads each weighing about 5300 lbs.; two minutes are required to set up the howitzer. The Austrian 15 cm. howitzer is not a long-recoil gun. The piece in the firing position weighs about 6000 lbs. and fires a shell weighing 85 lbs. bursting charge 18 lbs. ecrasite, and a shrapnel weighing 54 lbs. containing 380 bullets weighing 24.4 g. each. Maximum range is 6200 m.

Mountain guns.—All mountain guns with the exception of the Austrian are collapsible. The Japanese have even divided the gun itself into two parts. In order to obtain a low position of the trail, drop axles are used. The French 65 mm. mountain gun is peculiar in that it is fired from the position of maximum recoil.

[Russian Losses in Guns. Contemporaneous Notes on the European War. Editorial. *Artill. Monatshefte,* Mar '15. 5000 words.]

In time of peace Russia has 4434 light field guns, 444 light field howitzers and 64 heavy howitzers. The Germans have captured 1000 guns in East Prussia and 300 in Poland; the Austrians have captured 700 guns making a total Russian loss of 2000 guns not counting the 300 guns recently captured in the winter battles. Russia is now using guns of obsolete construction, and lacks guns with which to arm newly formed troops.

[The Employment of the Russian Artillery in the Present War. *Artill. Monatshefte,* Apr., '15. 4700 words.]

Russia has always shown a strong preference for field artillery but has never displayed

FIELD ARTILLERY—Continued

great tactical genius in its employment. After the Russo-Japanese War both sides appreciated their deficiencies and made energetic efforts to accomplish reforms. The new Russian F. A. Drill Regulations were too schematic, failed to appreciate the importance of the tactical employment of F. A. and showed a strong preference for defensive action. Nevertheless the Germans at the beginning of the war underestimated the efficiency of the Russian artillery. From their experiences in the Manchurian War, the Russians have shown skill in the use of terrain and cover. Their batteries are usually completely masked and placed on low ground. To prevent hostile observation, artificial masks are frequently constructed. Positions in cleared places in woods and villages were frequently taken. By doing so the Russians evidently renounced all intention of taking the offensive and deprived themselves of the great power inherent in a field artillery that possesses *mobility*. Observation stations admirably constructed and concealed were usually placed at great distances from the firing batteries. Observation ladders were seldom used. Each battery had a large supply of telephone wire, carried on a light instrument cart. The Germans should take advantage of such practical information even coming from the Russians. The Russians were skillful in reconnaissance. Their observation of the battle field was thorough and they possessed an organized system of communications. Russian panoramic sketches have been found, complete in every detail. Fighting in defensive positions they always had time to organize their communications which in many cases were so complex and uncanny that they broke down completely especially in battles requiring maneuver. Gun emplacements were always well intrenched and provided with overhead cover, usually only the guns were emplaced, ammunition being stored in the bomb-proofs. This is strongly recommended, permitting fullest use of cover. Good intrenching tools must be supplied.

The Russian fire was usually not very effective. Had the Germans made better use of cover their losses would have been even less. The French principle that a battery can seldom be destroyed and usually only neutralized is seemingly confirmed. The Russians have been very wasteful in expending their ammunition, and frequently batteries were short. Light batteries used shrapnel almost exclusively. Howitzer batteries used mixed ammunition, four pieces firing shell and two shrapnel, or vice versa. Just before the war a large increase in field howitzers was made and assigned to each army corps.

The figures of past wars are of little assistance in attempting a solution of the ammunition supply problem. Everywhere the supply seems to have been inadequate.

On the defensive, the Russian artillery has shown great superiority and resourcefulness. This is due to its peace training in large commands in which the massing of the fire of several batteries was practiced. The higher artillery commanders obtained splendid training and the batteries became efficient in fire technique. An organized system of espionage was of great assistance to the artillery commanders. Example is cited where a German battery had, during the course of two days, occupied three separate masked positions, changes being made under cover of darkness. Each of these positions was later taken under fire by the Russians in proper order, but fortunately always a few hours after the German battery had left the particular position. The Russians must have had an information bureau where information of this nature was collected and then transmitted to appropriate commanders. In spite of this organized system it is seen that waste of ammunition was not prevented.

In every case where rapid decision, quick orientation and aggressive offensive action were necessary, the Russian artillery fell down. In such cases, systematic adjustment, proper distribution of fire was not attempted. One could scarcely believe that it was the same artillery which had acquitted itself so splendidly on the defensive upon a previous occasion. During the strategic retreat of the Germans from the line of the Vistula, the Russian artillery neglected to take advantage of many favorable opportunities to inflict by direct fire, severe damage upon the Germans. The reason for this is that the Russians as a result of the Manchurian War, practiced methods of indirect fire only, and therefore were unable to act quickly and decisively by using the more simple and rapid direct method when the opportunity presented. The old artillery axiom that "the one who is first to obtain adjustment will be the victor," is now modified by adding that "the one who uses the simplest methods will be the first to obtain adjustment."

[Plain Speaking in the Lords. News item. *Weekly Edition London Times*, June 11, '15.]

Lord Stanhope, recently returned from the front, said in the House of Lords: "I am stating nothing that every German staff officer does not know when I say that, speaking broadly, the French hold their trenches by a few rifles and the support of their wonderful 75mm. guns; while we hold our trenches, broadly, by rifle fire. The French system is expensive in ammunition. Ours is expensive in life."

[Our Baptism of Fire. By Maj. A. Seeger, 15th F. A. German Horse Artillery. *Artill. Monatshefte*, June, '15. 5000 words.]

The horse battalion, 15th Field Artillery, was mobilized with the Cavalry Division of the XXI Army Corps a few days after the war broke out, with orders to protect the frontier between Metz and the Vosges Mountains against an expected French offensive. On Aug 8, a strong hostile force composed of cavalry, artillery, and cyclists was reported south of Lunéville. The Germans advanced on the road St. George-Fontcrey, the advance cavalry moving on Blamont-Domêvre-Verdenal without having found the enemy. Blamont was taken by Bavarian riflemen. Treacherous conduct of the inhabitants led to terrible summary punishment which included all

the neighboring villages. The next morning the advance was again taken up. The artillery took a position in readiness. Observation with telescope disclosed heavy clouds of dust near Gondrexen-Reillon-Chazelles. The range was too great, 6 km., and I refused permission to disclose our position by opening fire. At 3:00 p. m., the battalion was ordered to advance, via Autrepierre to Gondrexen, supported by Bavarian Cyclists and Jägers. Shortly after going into position near Autrepierre, a force of cavalry showed itself at 5000 m., trotting down the road from Reillon. Surprise fire was opened upon the enemy, who was quickly dispersed with visible losses. The march to Gondrexen was resumed with the cavalry in front and continued through to Chazelles, where our patrols came rushing back and reported a strong hostile force of cavalry, artillery and cyclists, on the low ground between Fremeuil and Ogeviller. I rode forward 1500 m. and quickly reconnoitred a position on Ridge 297, southwest of Chazelles. I had previously considered the possibility of coming within range of Ft. Manonviller, 8 km. distant on our right front. At 3800 m., on the road below, the enemy was in march, cyclists in columns of twos on the road; artillery halted by the road side; cavalry in assembly formation. Our cavalry was deployed in dismounted action, and under a desultory small arms fire. The three batteries went into an open position at a gallop. My orders to the battery commanders were: "Haste is urgent. Here's a chance to get a few Iron Crosses. Fire on everything you see down there;—right battery, cyclists; center, artillery; left, cavalry." It was realized that effect and surprise were more important than cover. The cyclists were the first to feel the fire. One half foolishly sought to escape by flight; the other half wisely took cover. The artillery were soon immobilized. The cavalry disappeared in a mad flight as soon as fired upon. Visible effect was produced on all the targets. Then suddenly the French artillery opened fire. Although they bracketed the range quite accurately on the center battery, their effect was small. Our men began to take cover. We searched for the hostile artillery everywhere, but could not locate them. We had resumed the firing on our former targets, when shortly after this the guns from Ft. Manonviller enfiladed our line with heavy shell. A hit would have done damage. I quickly gave orders to withdraw the guns by hand behind the crest. Although on the crest in an open position, this cross-fire caused very little damage. Our position was evidently disclosed by telephone to Manonviller. Our limbers in rear suffered some losses. Orders then arrived to withdraw. I passed the word along, and saw two batteries leave the positions. After having covered about 3 km. I learned that the order did not get through to the other battery. I hurriedly sent for it. On receiving report of the losses, I learned that they were very small. Our impression from this fight was that the French firing was poor and ineffective. Later on, we found it necessary to revise this opinion. It was good to hear the ungrudging appreciation of our cavalry comrades as well as to learn of the decisive effect of our fire both upon the hostile column and the neighboring village. Valuable lessons were learned from the mistakes which we made.

[The Two Field Guns in Use, Our "75" and Their "77." Translation into English. *Field Artillery Jour.*, Apr.-June, '15. From *L'Illustration*, Dec. 12, 1914. 2400 words. 4 illus.]

—Use of in European War—Lessons from

[The Artillery Question After the World War. By Major af Wetterstedt. *Artilleri Tidskrift* (Sweden), 3d and 4th numbers, '15. 10,500 words.]

Undoubtedly, after this World War, a great deal of the European artillery matériel will be worn out or in other ways rendered useless, and new supplies on a big scale—if the armament race continues as heretofore—will be necessary. It is also certain that the experiences of the leading military nations will call for a reorganization of all the branches of field artillery. Artillery must keep pace with the new ways of carrying on war. The supply of present type ammunition that will be left over at the end of the war will be small, so that the manufacture of new types of guns will be made less expensive.

The phrase, "field artillery," must be taken in its widest meaning, *i. e.*, the artillery that is able to follow the troops everywhere and to support them as well in mobile warfare as in the stationary or trench kind. If we look back on the development of the last century, we will find that the principal piece of this artillery, the light field gun, has held its place in each type for about twenty-five years. The rifled muzzle-loaders came into use during the period 1855-63. Eighteen years later the rifled breech-loader was introduced. This gun held its place for twenty-four years, and was succeeded by the present field gun, although the work on this new type was begun long before this time. Then there ensued rapid progress in the development in the field gun, and it is now time for a new type. The present question, however, has to do not only with one gun, but with the whole field artillery question, including organization.

(The article here goes into the history of the development of the field artillery.)

It may be premature to discuss field artillery now, as the results of the war will not be known until sometime after its end; but certain conclusions have been confirmed by reliable information from the front, so that an outline for the future field artillery can be attempted. A compilation of the information received so far will give the following results: The fights have become more stationary, of longer duration, and tend to become more like siege operations. For this reason, heavy field artillery has become more important. Long-range guns have proven a great success, so that we may expect future development along this line. The enormous loss of field pieces shows that they are not kept far back of the infantry, and that they will have

FIELD ARTILLERY—Continued

it with artillery must be developed. The ammunition consumption seems to increase so that greater attention must be given to the collection of ammunition before the war, and the further development of the internal industries of a country for the manufacture of war material is necessary.

Heavy Artillery.—The most important of the above conclusions is that the heavy artillery has not only shown its importance, but has fixed its place permanently. The increase of this type of artillery will most likely be one of the results of this war. The present typical heavy field piece in most armies is the 15 cm. howitzer, the nucleus of the heavy artillery. A lighter howitzer in use in France, Russia, Japan, Servia, and Bulgaria is the 12 cm. to be made even lighter. Firing at long range by indirect method has proven the normal practice. Firing from concealed positions is so much used that the flying corps must be permanently combined with the artillery. Aerial warfare has become such a real factor that a new and effective method of fighting In Germany, Austria, Sweden, Rumania, and Turkey there is the 10.5 cm. In a few countries there is only one kind of howitzer in use: in Italy, 15 cm.; in Norway, Holland and Switzerland, 12 cm.; in England, 11.4 cm.; in Belgium, 9.5 c.m. All these lighter howitzers are, for reasons to be shown later, counted in the heavy howitzer class. The many types of field pieces show that there has not been a standard plan for the artillery system.

Undoubtedly, the heavy artillery will hereafter come to be the mainstay of the field artillery. Trench warfare and long-range indirect firing have lessened the importance of weight in transportation. Instead of taking long, circuitous routes with the pieces to get near an open position without discovery, a concealed position is taken up immediately for indirect firing. Of course, the weight should be kept at a minimum for mobility. Experience has proved that such heavy pieces as the 15 cm. howitzer and the 10.5 cm. gun with traction-weight of up to 3000 kg. are easily carried along with the mobile army. This weight can be reduced by separating the gun and gun carriage. (The article here goes into the description of the French Rimailho system and ballistics of the heavy artillery.) The conclusion is that the 15 cm. howitzer, with a range of 10.000 meters, can be made as mobile as the present field gun by dividing the assembled piece into three parts for transportation, the heaviest of which would have a traction-weight of 2200 kg.; and that at present, as well as after the war, this is and will be the standard heavy howitzer. Likewise, with respect to the lighter type of howitzer, the conclusion is that the best compromise between power and mobility, considering also the best tactical advantages, the 10.5 cm. caliber with shield will give the best results, and at the same time have the mobility of the present field gun. Of course, the specialty of the heavy howitzer will still be against fortifications; but there are cases when it can be used against troops when they are in heavy woods, in ravines, or rugged terrain, etc. The lighter howitzer is a sort of universal piece, and the scope of its work is much like that of the heavy field gun. The heavy field gun has the advantage over the light field gun of range and greater destructive power; and, although it will be a part of the big armies, it cannot be said to have many advantages, but must be considered as a special piece. Again, there must be a compromise between power and mobility. It is a gun that must be early in the fight, and for that reason must be well up in the march column. With its long range, it must make the enemy develop early, keep back his artillery, and protect its own troops. In the later phases of the fight, when the troops have taken shelter, it will be of little use. The conclusion after comparison of ranges, weight of projectile, and weight of the separate parts of the gun for transportation, is that 10 cm. is the best caliber for the heavy field gun. It should have a relatively flat trajectory, a shield, and should be divided into parts for transportation, the weight of none of which should exceed 1800 kg.

Light Field Artillery.—We now consider the fourth and last piece—the light field gun. Before the war this was considered the main piece of the artillery, but there is no doubt that the heavy mobile artillery will occupy this position. However, this light gun must be made as powerful as possible and still be kept light enough to pack. Its range should be at least 7300 meters. Under normal conditions, it will be transported on a gun carriage. It must be lighter than the present gun, and should weigh about 650 kg. with the shield. The carriage, too, must be lighter than the present one. Its maneuvering ability should be such that its transportation on pack animals should be necessary only under the most difficult conditions. The old light artillery has not kept up with the old heavy. The present light gun is not powerful enough to be used as heavy, and is not light enough to follow the infantry—it is not mobile enough to stand surprises. If it is made lighter, there will result the better co-operation between the infantry and artillery that is so much needed and sought after. It is essential that the artillery, or at least this branch of it, should be able to follow the infantry everywhere. Mountain artillery is excellent for this purpose, but there is too little of it and it is not powerful enough. The Greeks attribute a large part of their success in the Balkans to this latter kind of artillery. The infantry's demand for immediate help at the proper place, at the right time, and in the right direction, requires a very mobile piece.

However much long-range fighting may develop, it has been proven that close fighting will play an important part. The bayonet is still the infantry's most dangerous weapon. Let us not make the same mistake in the artillery question. The same weapon cannot be used for both distant and close fighting. The light gun should be a typical surprise

weapon that can open fire from almost any place.

We have seen the growth of another weapon that apparently has come to stay—the machine gun. But it has been shown during this war that the machine gun's most dangerous enemy is the artillery. Even at close range, the artillery will have the best chance to fight the machine guns if they can be located. The long-range guns have no prospect of locating them, and it is a difficult proposition even at the ranges of the present light gun. The solution of the problem is artillery that can be brought up under cover of the infantry to the short ranges at which the machine gun can be located.

Organization.—The above artillery system includes four pieces, of which three are relatively heavy and powerful, and one very light. Under ordinary conditions, this system would be considered ideal. It may, however, become a reality if one of the leading states, which is not improbable, should suddenly discard all the old types and rebuild its artillery on a new basis and on new principles. The forecast rests on a more solid foundation than it seems at first sight.

The light, universal howitzer, as has already been shown, will be the main piece, and the kernel of the divisional artillery. The heavy howitzer is a typical corps and army piece, as it needs a larger scope for its activities. It is hard to say where to place the heavy gun. Its tactical purposes come under that of the divisional artillery, but it needs greater liberty as to mobility than that given to divisional artillery. The heavy howitzer and heavy gun are both special pieces. They do not fit in anywhere as does the lighter howitzer. The heavy howitzer is usually employed relatively late in the fight. When it comes to breaking a strong line it is the main factor; in fact, the only artillery that has any important effects. The heavy gun, on the other hand, comes in early in the fight. It is the piece for the rencontre. Its ammunition is not so heavy and hard to transport as that of the heavy howitzer, and can be used with less consideration. These are qualities that seem to make this piece most suitable for division artillery, but here we have already the light howitzer, and the heavy gun would be superfluous. Its right place is an open question, the answer to which should be an outcome of the present war. The light gun that is carried on pack animals will fall outside the regular artillery, and ought to be united with the infantry.

Besides the heavy field artillery, we have the mobile siege artillery. When trench fighting develops into stubborn siege warfare, this type comes into use in the field. Of this we have at present in the war the relatively light 21 cm. howitzer and the powerful group of from 28 to 30.5 cm. caliber. The famous German 42 cm. howitzer cannot be considered as mobile.

[A Scout's Note-book. *Revue des Deux Mondes*, Aug., '15. 31 pages.]

[This diary of a corporal of artillery, kept from the outbreak of the war until the retreat of the Germans after the battle of the Marne, does not lend itself to useful abstraction. It will repay reading, because, as the editor of the *Revue* himself remarks, it narrates in simple fashion the facts which its author witnessed, and is characterized by sincerity and accuracy, by good humor, calm, and confidence. The striking professional note is the terrible efficiency of the French 75 mm. —ED.]

—Use of in Italian Operations in Tripoli

[The Third Provisional Regiment of Artillery. By "Gunner." *Riv. Mil. Italiana,* Apr., '15. 8000 words.]

Four batteries, armed with 9.06 cm. guns of the newest model, and coming from Venaria Reale, Novara, Vigevano, and Brescia, were assembled at Naples early in October, 1911, and organized into the 3rd provisional regiment of field artillery. Officers and men took the greatest interest in the preparations for service and in speculations upon their destination. Orders to embark were received and on Oct. 12 guns, caissons, wagons, horses, and mules were placed aboard ship. At 4 a. m. on the next day the expedition sailed from the Immacolatella. There were 13 transports, guarded in front, flanks, and rear by torpedo boats and torpedo boat destroyers. The expedition passed to the west of Sicily and came in sight of Tripoli on Oct. 15.

The marines had already driven the Turks from the city and had formed a line surrounding it, but they needed reinforcements and their 8 cm. bronze guns were not of sufficient power for a proper defense. Therefore the 9.06 batteries were ordered to land without delay and reinforce the line. By Oct. 17 they were on shore and were assigned to positions.

In the afternoon of Oct. 25 the regimental commander received orders to move to the trenches at the Messri line. During the night the enemy advanced close to the Italian trenches and early in the morning made a furious attack. The 9.06 guns supported the infantry in the trenches, using shrapnel set at zero. The enemy retreated, and was pursued with fire of rifles and field guns, the latter using shrapnel with increasing graduations up to 3000 m. All four batteries of the regiment took part in this baptism of fire. About 150 rounds per piece were fired. The action ended about 11:30 a. m.

On Nov. 2 at 6:15 a. m. the enemy began a fairly well-sustained artillery fire. The fire ceased at 7 o'clock. Later in the day a few shots were fired, and in the succeeding days there was an occasional shot, apparently for the purpose of inducing the Italian artillery to expend its ammunition. The Turkish fire was absolutely ineffective, due probably to antiquated guns, damaged ammunition, and lack of skill in firing. The Italian fire was unable to silence the Turkish guns, even by searching zones 600 m. in depth. The ground was undulating and deceptive.

On Dec. 4 an attack was made on a marshy oasis held by the Turks 7 kilometers south of Messri. About 40 field pieces took part in the action, including the 9.06 guns, some

FIELD ARTILLERY—Continued

7.5A batteries in trenches, some mountain batteries accompanying the infantry columns, and four pieces that had recently arrived from Italy—two 14.9 G guns and two 21 cm. mortars. The fire of the larger guns was kept up till it was dangerous to the infantry drawing near to the enemy's position, after which time the infantry was supported by the mountain guns. The Arabs abandoned the position and fled on camels. Lack of cavalry on the Italian side prevented a more complete success.

This was the last action in which the entire regiment participated. During the winter it was occupied in training, particularly in making practice marches through the sands of the desert. Two of the batteries each built a redoubt. The time was also profitably spent in making intimate acquaintance with the infantry, thus laying the basis of one of the elements of success on the battlefield, i.e., close acquaintance of different branches of the service and the habit of living and working together.

Early in April one battery of the regiment embarked as a part of a division sent to operate near the western boundary of Tripoli, where the battery took an important part in a number of actions. The other batteries continued their training in marches and reconnaissances, varied by occasional orders to prepare for active operations, of which nothing came till June 8. On that date the batteries took part in the attack on Zanzur. The first position of the batteries was in the rear of the infantry. After the latter had advanced, the artillery moved forward 1500 m. in open line over firm ground at a trot and took position on the firing line at 2000 m. from the enemy. The pieces fired at first with a fixed elevation, and then with varying angles to stop the movement of the enemy's reserves. The artillery commander occupied a central position and directed the firing according to information received from observers. When the infantry reached a line 1000 m. from the enemy, the artillery advanced in echelon, two batteries advancing at a trot while the third kept up the fire. The guns fired over the infantry, which was only 200 m. in front of them. The Arabs retreated in disorder, followed by fire to 5 kilometers. The action was over at 11:30 a. m. The guns used shrapnel; the total consumption of the three batteries, 12 pieces, was 800 or 900 rounds.

The last action of the provisional regiment took place on Sept. 20, south of Zanzur, where the guns proved their worth.

FIELD FORTIFICATIONS

See

FORTIFICATIONS—FIELD

FIELD KITCHENS

See

KITCHENS, MILITARY
TENTS—FIELD KITCHEN

FIELD POST

Germany

[The German Post Office and the German Army. By Dr. Alfred Gradenwitz. *Scientific American*, July 3, '15. 1500 words. Illus.]

The German Field Post contributes largely to the contentment of the men by carrying free any ordinary post card or letter to and from soldiers, when it weighs no more than 50 grams; and postal orders and letters of more than 50 grams are charged for at greatly reduced rates.

The details of the postal communications were carefully prepared before the war, but, of course, due to the sudden changes of train schedules at the outbreak of hostilities, the arrangements did not move smoothly at first.

The address of a letter bears the designation of the army organization of the addressee, and, accordingly, the postal department had to be informed of the assignments of organizations. For this purpose a printed guide is issued and revised periodically.

The number of letters and post cards delivered to the army is about eight millions daily, and four millions are returned; which indicates the enormous task. The sorting of the mail is done at twenty-three offices in the main industrial centers, and mail for each organization is put in separate bags for forwarding. These are sent to the Guiding Stations close to the frontier, near the starting points of the lines of communication. The domain proper of the Field Post commences here, and the lines of communication are devoted to its purposes so far as not detrimental to military operations. Relay stations along the routes are placed to care for delays in transportation as far as possible. To each army corps is attached a field post office, with branches in the smaller organizations. Mail is not delivered to the smaller units but must be sent for by them. Frequently, at the front, large quantities of mail matter have fallen into the hands of the enemy, but these are only incidents of war.

Apart from the letters, post cards, &c., enormous quantities of small parcels containing refreshments, warm underwear, &c., are sent to the front by relatives and charitable institutions. Much of this kind of supplies is conveyed by the army authorities themselves, independently of the Field Post. In the week preceding Christmas no less than eight millions of such parcels were sent to soldiers.

FIELD WATER BAG

See

WATER SUPPLY—FIELD WATER BAG

FIRE CONTROL

See

FIELD ARTILLERY—FIRE CONTROL

FIRING REGULATIONS

See subhead FIRING REGULATIONS *under* FIELD ARTILLERY, *etc.*

"FLECHETTES"

[English Aero-arrows. Editorial. *Artill. Monatshefte*, Jan., '15.]

These arrows weigh 385 grams, have a feathered tail and great penetrative force. They are

thrown singly, whereas the French throw theirs in bundles of 50.

[Arrows Launched from Flying Machines.—Editorial. *Rev. Militar* (Argentine), May, '15. 800 words.]

The arrows are of steel, 8 mm. in diameter, 12 cm. in length, and weighing 20 grammes. A section of the shaft is turned down to throw the center of gravity near the head and insure the arrow falling point first.

The arrows are carried in brass boxes about 5 in. square and 12 in. long, having a capacity of 500 arrows. The boxes are provided with a hinged cover secured by a bolt.

When in flight the boxes are secured to the bottom of the fuselage, with the covered end below.

When the target is within reach, the aviator has only to open the box and the arrows fall by their own weight. If moving at a velocity of 100 km. per hour at an altitude of 1000 meters, with an interval of six seconds between the first and last, the arrows will be distributed over a rectangle from 4 to 5 meters wide and 150 meters long.

The moral effect of the arrows is great, as the wounds produced are practically always fatal. They are used principally against troops in mass, marching columns, captive balloons, dirigibles and aeroplanes.

FLOODING, Defence by

See

HOLLAND—MILITARY DEFENSE OF

FOCH, Gen. Ferdinand

The French General who was recently decorated with the Grand Cross of the Bath by King George of England was born at Tarbes in the Southern Department of Gers on Oct. 1, 1851. At the age of twenty-six he was appointed captain of artillery. He rose rapidly to the post of professor of tactics, with the title of Commandant, at the Ecole de Guerre, where he remained five years. His lectures and military works have been translated into many languages.

Having been created Brigadier General in 1908, Foch now succeeded to the directorship of the Ecole de Guerre, one of the most confidential positions in the War Department. He left this post to take command of the Thirteenth Division and afterward of the Eighth Corps at Bourges and finally the Twentieth Corps at Nancy. Early in the war he commanded the Fifth Army at La Fère-Champenoise, and in Oct., 1914, he succeeded to the command of the 3 armies of the north.

FORAGE

—For Artillery—Transportation

[Some Notes on Transporting Supplies. *Memorial del Estado Mayor del Ejército de Chile*. Jan., 1915. (Continuation from previous issues.) 1300 words.]

Supplies for a battery.—In brief, these consist of reserves of rations, ammunition, and repair supplies, in addition to those needed for daily issue.

The Chilean regulations require two days' reserve supplies to be carried, partly on wheel and partly on pack transportation, and the question to be solved is the quantity to be carried by each.

It has been considered that 4½ kilos is the proper load of grain for each led horse, but the ridden horses carry no grain, and this brings up the question of the so-called iron ration, the weight of which has not been decided.

So far as the forage is concerned, this study is founded on 4½ kilos of grain and 5 kilos of hay per ration, with a statement that an increase in weight of the forage issued will cause difficulties of transportation if additional facilities are not provided.

The regulations for the Chilean service are not clear concerning the number of animals with a battery, and calculations are made showing a total of 120 battery horses, in addition to the led horses, with a resulting total of 1235 kilos of forage per daily issue. This is carried in a 4-horse forage wagon, the total weight drawn being 2000 kilos, which is considered excessive.

Certain confusions in the regulations are commented on in the article, with the hope that the resulting discussion may clear them up.

FORTIFICATIONS

—Dummy Works

[Field Fortifications—Their Definition and Classification. By a Specialist. *Heiji Zasshi*, June 1 and 15, '15. 2500 words. Continued from May issues.]

Dummy works, if properly constructed, are difficult to distinguish from the real and are very effective in drawing hostile artillery fire and causing the enemy to make faulty dispositions.

1. Their location should conform to the general plan of defence.

2. They must not be in the same beaten zone as the real position.

3. They must be visible to the enemy from afar and be taken by him for the real ones.

4. If garrisoned with men and guns for the purpose of carrying out the deceit, provision must be made for their withdrawal and participation in the general defence.

5. Provision must be made for the flanks of the real position, in case the dummy should be actually occupied by the enemy.

In order not to be in the same beaten zone, the separation from the real work should be in depth about 200 meters and in width not less than 15 meters. The latter distance should be greater if possible as the occupation of the dummy by the enemy would endanger the real position. Also the direction of the attack, if influenced by it, would be more favorable if they are widely separated. Whatever their location, they should be made impracticable for use by the enemy.

Concealment, degree of completion, etc., must all resemble that of the real position and they should have even a small garrison and some guns of position real or imitation. If in front, they may be used as advanced positions, which, on account of the small size of the garrisons, will not meet with the usual objections to such positions—that of the line and difficulty of withdrawing.

FORTIFICATIONS—Continued

The trace is dependent on the configuration, the general situation, and the aim in view, and is either straight, curved, or bent. Each has its good and bad points and, in selecting the proper kind, the skill of the commander is made manifest. Due consideration must be given to flank and enfilade fire, concentration and direction of fire, ease of construction, and concealment.

—Field

[The Selection and Occupation of Lines of Battle.* By Capt. F. B. Downing, C. E. *Professional Memoirs.* Jan.-Feb., 1915. 10,000 words, 1 map, 2 figs.]

Only those positions occupied by an army on the *defensive* (a rôle which must not become habitual) are here discussed.

"Strategy selects, tactics occupies, and fortification strengthens a position." The strategy of the higher commander considers, in selecting a position: (a) location that will check the enemy's advance and hold him not less than three miles from the area to be defended; (b) an extent commensurate with his strength, say 4500 yards for a brigade, or one man to the yard; (c) security of the flanks; (d) time and labor available in strengthening the position; (e) the feasibility of resuming the offensive.

The higher commander bases his selection of the approximate line, perhaps many miles long, on a study of maps; but it is in the field, by the majors and captains, that the final siting will be done—a duty which requires for its proper performance skill and practise.

The infantry position is best concentrated along a single line; inner or reserve lines in general serve no useful purpose and impair the offensive spirit of the troops. (An exception is noted in case of the near-defense lines of seacoast forts, which really constitute elements of the forts themselves.) This single line will not be unbroken, but built in sections of suitable length for the units that will occupy them. Supporting points will be used, but any type form of redoubt is to be avoided; simple inconspicuous ring trenches are infinitely preferable to the elaborate redoubts that offer congested targets. Advanced points will in general be shunned.

The commanding but conspicuous location on the military crest will usually be avoided by moving further down the slope, despite the increased difficulty of withdrawal. Though a good field of fire is the first consideration, a zone no wider than 200 to 300 yards may suffice if well covered by fire. The importance of *concealment* was emphasized by the Russo-Japanese War; it is particularly desirable in the early stages, and is secured by making the parapets low and adapting them to the surroundings. Obstacles are also of prime importance; best of all are such natural obstacles as streams, marshes, etc. Of the many types of artificial obstacles, the high wire entanglement is most extensively used; the distance from the trenches will average about 50 yards

Artillery, siege and field, is preferably located from 200 to 1000 yards behind the line of trenches, the positions being carefully prepared with a view to concealment and protection. It should cover all approaches to the defensive line; a part may be held in readiness to take position later. Machine guns are employed in the infantry trenches.

The importance to the defense of good communications, the necessity of telegraph and telephone lines, the employment of engineer troops, the increasing usefulness of the aeroplane for reconnaissance and possible raids—these need not be dwelt on here.

[As an illustration of the above principles is quoted in full Kuropatkin's order for the defense of Liaoyang, with its detailed dispositions as to troops, its provisions for the flanks, the artillery positions, reserves, dressing stations, etc. Stackelberg's position with the First Corps at Shou-shan-pu is then described in detail (with map)—the topography of the commanding hills, and the elaborate line of semi-permanent works, in which the Russians had utilized nearly every device known to field fortification. The sod-covered trenches and rock breastworks were skilfully concealed; covered communications amply provided; approaches closed by wire entanglements, pits, and fougasses; alternate positions prepared for the artillery; a field railroad in operation. This position held the Japanese at bay for 48 hours of almost continuous fighting, until the general retreat ordered by Kuropatkin.]

*This article was written before the present war.

[Fortifications, Their Definition and Classification. By a specialist. *Heiji Zasshi,* Apr 1 and 15, '15. 4600 words. Definition and classification omitted.]

Heretofore, there has generally been a tendency to use fortifications negatively, and many are the illustrations where victory has gone to the attacking force because the defenders stuck to their positions and made only a passive defence.

Whether in attack or defence, the position must be used to its fullest extent in order to accomplish the purposes of the battle.

In an attack against an intrenched enemy, it is sometimes necessary to approach by constructing successive attacking positions, but the use of intrenching tools during this advance requires careful consideration. Their use means a loss of time to the advance, weakens the spirit of the attack, and lessens the morale. At the same time, it allows the enemy an opportunity to strengthen his position.

Configuration of the ground is most important to the defenders and defects must be compensated for by fortifications, which should be used not for a mere passive defence with its consequent loss of freedom of movement, but with an eye to seize every opportunity to change to a decisive offensive by which only can we hope for a real victory. If we mean only to check the enemy, the entire force is thrown into the engagement. Otherwise, we must economize our strength assigned to the defence and stop the hostile attack by means of a small force, reserving a strong force for the offensive action. That is, a defence combined with offensive action is the normal one;

a delaying defence is the exception. Positive action is essential to success.

Prior to the Russo-Japanese War, it was considered bad practice to construct earth works before the plans of the enemy were known, but the experiences of that war not only teach otherwise but sometimes require it. However, we must never hesitate to cast them aside in order to meet changed conditions or to take the offensive. This is a provision not only of our own Infantry and Field Artillery Drill Regulations but of the German Drill Regulation as well.

Another result of the war is to cause us to drop the idea of successive lines in defensive works. However, should there be more than one line, each line should be occupied from the beginning. The men driven from the first line, pursued pellmell by the enemy would, in their more or less demoralized condition, be most difficult to check and control for effective work in the next succeeding position.

Other objections to successive lines are the division and separation of the command, breaking up of tactical units, and the bad effect on the men of knowing that earthworks are in rear.

Defensive works in one continuous line, however, are objectionable because they require an unnecessarily large force to defend them and, once penetrated by the enemy, defeat is almost certain. Also, due to the excellence of the present fire arms and to the great extension of the battle fronts to-day, earthworks giving proper protection whether in successive lines or one continuous line, would require much time and labor in construction.

We have therefore adopted one line with intervals as our plan for defensive works. It economizes in men as well as time and labor; the effect of the loss of one group is not immediately communicated to the neighboring groups; fire from other groups may be concentrated on hostile attempts against a particular group; the intervals may be used by the defenders for making sorties; and if, during the night, the enemy penetrates these intervals too far, he may be made to pay dearly the next morning.

The firing line is so planned that all dead angles are covered by flank fire and that neighboring groups give each other mutual support. The length of the intervals is not dependent on the size of the garrison but on the configuration of the ground. In level open country, it is fixed by considerations of the configuration and effective rifle range.

The duty of each garrison (ordinarily a battalion) is to defend its own front and flanks without thought of outside aid. A less force would be weak in resisting power and would mean a splitting up of the tactical unit. A regiment is too large. It is not an economy of strength for ground covered nor of time and labor required for constructing a suitable sized work for its occupation.

Our Drill Regulations say: "In defensive works, we do not establish several lines so as to be able to resist by successive steps. We construct only one position, but make that stronger. We do not have one continuous firing line but divide it into several groups. When the garrison of any district is large, it is generally considered best to divide it into battalion groups."

[Fortifications—Their Definitions and Classifications. By a specialist. *Heiji Zasshi,* May 1 and 15, '15. 5500 words.]

Earthworks, especially defensive ones, should be well concealed, otherwise the defenders may as well send their visiting cards to the enemy.

Their positions should conform to the configurations. If built on the summit of a hill, the works will be projected on the skyline and readily recognized by the enemy when still far off. They should be built on the military crest. Artillery positions should be withdrawn from the military crest so that the muzzles of the guns are just enough exposed for direct fire, but cover from view of the enemy should be constructed. Should the firing line for any reason be placed on the summit, a background should be provided.

Earthworks should not be placed in the edges of woods and villages, but in front of them. Recognition is thus more difficult, and this position offers protection and assistance in supply of the reserves.

All parapets should be low and of a gentle slope to the front; all angles and edges should be rounded off, conforming to the natural configuration; disguises should be made with objects at hand, but not by means of trees and shrubbery cut down, as these will soon wither; plant quick-growing seeds or transplanted shrubbery; briefly, the general color scheme of the vicinity should not be disturbed. By similar use of trees, shrubbery, tall grass, etc., cover for positions of troops, roads of approach for artillery and columns of troops may be provided, but such cover must never interfere with a free field of fire.

It is absolutely necessary to protect against aerial reconnaissance. Should the enemy make use of it, fire on him with field artillery. At the same time, cloud his view by means of bonfires in the vicinity. This was successfully resorted to by us in the Russo-Japanese war. At Tsingtau, the Germans lopped off the tops of trees, leaving the lower branches intact, and, by the free use of paint, reduced everything in the vicinity of the works to the same color.

An inspection from the viewpoint of the enemy will disclose errors and points overlooked, and corrections to be made. It should be remembered also that the exposure of one's person is the quickest and most positive means of disclosing the position.

A good defensive position should be strong to the front, but should the enemy foresee this point, avoid it, and, by a turning movement, attack one or both flanks, it should be one that would readily lend itself to the necessary change. Its principal requisite is a clear field of fire. Other considerations are a gentle slope and a good view towards the enemy. Whatever interferes with a clear field and a good view must be removed, as well as those objects which will give cover and protection to the enemy.

FORTIFICATIONS—Continued

Firing at long range is generally a waste of ammunition, as compared to the loss inflicted. It also, early in the action, discloses the position to the enemy. A sudden deadly fire at effective range is more efficacious.

Time, configuration, number of men and tools available, obstacles to be built, etc., all must be considered in the plans for clearing and concealment.

Lone trees, tall groups, towers, etc., that might be used by the enemy for ranging should be levelled, while the distance to such objects as may be used by us should be carefully measured. If no such objects for us exist, artificial ones should be constructed, their positions located and distances from the position noted on a sketch which should be furnished to the firing line.

Briefly, so far as time and labor will permit, nothing which will increase the efficiency of the defenders' fire, decrease that of the enemy, and, at the same time, assist the defenders in taking the offensive must be neglected.

See also

BARBED WIRE ENTANGLEMENTS
ENTRENCHMENTS

—Field—Experience With in European War

[Military Notes. The French and German Fronts in France. By Paris Correspondent (J. B. G.) *Army & Navy Jour.*, Aug. 21, '15. 900 words.]

Instead of a long and thick cordon of massed trops, the armies on both sides on the western front are disposed in a depth proportionate to the length of the line. Measures have been adopted which make it extremely difficult for either side to advance, hence the present deadlock.

The general plan is a three line fighting line defense. In the first line trenches are merely enough men to hold an attack momentarily. In the second line of trenches, where greater protection and concealment can be secured, are the supports which can quickly come to the assistance of the men in the first line. In a third line still farther back are the main sector reserves, quickly available to make or repel a general attack.

The French and German works differ slightly. The principal French line of resistance is covered by a line of fortified advanced posts on which the enemy must expend a part of his energy before he encounters the main line. In the German system, the first line is the main line of resistance, sometimes very elaborate as at the Labyrinth. This line is made up of three or four lines of parallel trenches on a depth of about 400 meters, with well concealed communicating trenches. Behind this at a distance of 2 or 3 km. is a line of fortified points, capable of powerful defense.

Unable to pierce this line, the French have turned to aviation as a means of inflicting damage. There are signs that the mastery in the air is slowly passing to the French.

The machine gun is very important, but the bulk of the desultory firing must be done by the rifle, hence the importance of marksmanship, neglected in the past by the French. The French bayonet is excellent. Hand grenades are being manufactured by millions, and weekly grenade throwing competitions are being held in France.

See also

FORTIFICATIONS—PERMANENT—EXPERIENCE WITH IN EUROPEAN WAR

—Field Tactics

[Field Fortifications and Maneuvering. By Colonel Juan Avilés, Spanish Engineers. *La Guerra Europea*, July 2, '15. 1500 words.]

Since the military power of a nation is a function of the vital energies and resources of the country, there are not in Europe two small States even whose forces are equal. To oppose a front to the invasion of a more powerful neighbor, recourse has always been had to two means: the first, alliances and treaties; the second, an appropriate organization of the army and a method of carrying on war with inferior numbers.

For many centuries, the factor which made up for material weakness was permanent fortification, the creation of strong places. Their number became exaggerated; war became conventional and even absurd in its methods. Under Napoleon, however, it became understood that the decision was in the man and not in the material obstacle, in armies and not in strong places. And then it became recognized that the salvation of the weaker army lay in *maneuvering*.

Now that means of communication are so extended and that a movement can hardly be started without becoming known to the enemy, the less strong army is deprived of the hope of surprising the enemy and, even if it succeeds in so doing, the latter easily unites overwhelming forces before he is routed. It is on this account that, in modern theaters of war, so much importance is given to the destruction of communications by the one who retreats and to their reconstruction by the one that advances. And it is also on this account that maneuvering has shone more in the Russian provinces and Galicia, thinly populated and with few and bad roads.

Material disequilibrium was not slow in appearing in the Western theater. The German turning movement came to naught:

1. On account of the existence of the screen of French fortresses on the northeastern frontier.

2. On account of the dispatching of troops from that theater to Russia.

3. On account of the rapidity with which the Allies were able to place an army north of Paris, thanks to railroads and automobiles, threatening the German right.

Then it was the Allies' turn to fail in their maneuvers. Their repeated attempts at enveloping maneuvers towards the northeast were contained in time by the invader, who took immediate notice of the plans of the enemy and had means of transportation sufficient to move troops to the sectors of attack. With all that, these troops would have been driven back if they had not strengthened themselves by field-works, which underwent an evolution to

bring them into harmony with modern demands.

At first sight it appears a contradiction that, as the importance of permanent fortifications disappears, that of field-works is increasing. But this contradiction disappears if we realize that this decision rests with the man, with the troops. Permanent fortifications have the fatal defect of immobility and must be reserved for certain concrete and special cases.

On the other hand, field fortifications mould themselves always to active operations. Their loss does not bring rout. That is their strength; they are used when convenient and may be given up without difficulty, sacrifice or serious results.

Trenches capable of containing a formidable enemy have to fulfill so many requirements, have to be constructed so rapidly and efficiently, require such an accumulation of offensive and defensive means, and have to be so well connected with headquarters and lines of supply that they need the supervision of well-trained officers and the work of troops which, without losing their character of specialists, can at the same time be employed like the other combatants. The Germans have increased the number of sappers assigned to a division from one company to a battalion.

—Field vs. Permanent

[Some Thoughts on Fortifications. By Maj. Gen. v. Richter, German Army. *Artill. Monatshefte,* Apr., '15. 3500 words.]

The present war has shown that field fortifications when placed within supporting distance of each other are able to offer more resistance than the strongest and costliest permanent fortifications. This in spite of the fact that the same tactics and implements of war have been used in both cases. The location and the details of construction of permanent forts are usually well known to the enemy. Field fortifications on the other hand are less known, are less conspicuous and the observation of fire effect upon them is very difficult. The effect of artillery fire is usually also so localized that repairs can be quickly made. If time is available they can be made so strong that light field howitzers will produce little effect. Shrapnel can be used only to compel the occupants to keep under cover. Direct hits with shell will produce great moral effect, but observation will usually be difficult. The principal gun for attack will always be the heavy howitzers and mortars. Victory can only be obtained by pushing home an infantry assault.

Several years ago Gen. Langlois advanced the theory that any permanent fort could be forced to capitulate if surrounded by 155 mm. howitzers and light field guns supplied with sufficient ammunition. His plan was to create a hail of fire to hold the besieged to their cover and then advance the infantry without suffering appreciable losses. The present war has shown the fallacy of this plan because this artillery would not have been powerful enough to completely destroy the defensive forts as had to be done in Belgium.

It is premature to say that permanent forts are no longer necessary. They are needed to protect important centers from surprise attack by a mobile force. Progress made in modern methods and implements of war, especially in aircraft, also makes it dangerous to rely on field fortifications alone. The subject should be carefully studied before coming to any positive conclusions.

Armor, concrete and masonry are no longer able to stand the destructive effect of modern heavy artillery. Since high explosive projectiles completely disrupt and crumble concrete constructions, it is proposed to return to brick and stone masonry walls. Some authorities doubt very much whether even these can withstand the effect of a 40 cm. shell, weighing 1000 kg. and carrying 150 kg. high explosive. Gen. Brialmont foresaw the asphyxiating effect of H. E. shell but believed the gases would come from without. The armored turrets of Liége did not withstand the penetrative power of the H. E. shell of large caliber howitzers.

Future endeavors must be directed toward finding some material for walls, parapets and cover that will not disrupt nor be penetrated by H. E. shell. A compound armor plate invented by Schaumann may solve the problem. The best protection will always be an inconspicuous outline of the fortifications arranged in several lines which will prevent the enemy from making a flank attack and compel him to expend enormous amounts of ammunition in order to succeed.

—Permanent

[The Value of Permanent Fortifications. By "C." *Kriegstechnische Zeitschrift,* Jan-Feb, '15. 6500 words. 1 plan.]

The best defense of the Fatherland is a rapid and well-sustained offensive by a strong and thoroughly trained force. Such a defense requires no land fortifications. Other countries have built land fortifications on the theory that they would furnish points of support for forces acting on the offensive. This theory is not borne out by the operations of 1870 or the recent operations in Belgium.

France has always built extensive permanent fortifications, but the Germans have placed little confidence in such works. The present conflict may upset many of our ideas, and it may not be amiss to outline the fortification problem. A land fortress may be considered "modern" when the works and their grouping meet the tactical requirements of their locality; when the guns and engineering features are superior to those which the enemy can bring against them; when they possess sufficient defensive power to withstand a siege; and when they are proof against assault prepared by any artillery that can be taken into the field.

None of the existing fortifications are modern in this sense, even disregarding the 42 cm. howitzer. Siege artillery is now superior to the means of defense, and modifications in type of fortifications must be made to meet this superiority. The modifications will be expensive, but expense must not be spared or the result may be failure. Battleships go to the scrap heap in 20 years, and we must recognize that fortifications are similarly of limited life.

FORTIFICATIONS—Continued

It may be argued that fortresses are obsolete, and that improvised trenches will answer, but it is not the French and English trenches that have stopped the German offensive.

In general terms, permanent fortifications should be built where it is desired to bar the advance of an invader. The greater their passive strength and the better their equipment, the greater will be their power to check a hostile advance and to facilitate the action of friendly troops.

The trench is a valuable adjunct of permanent fortifications, but can never replace them. Trenches call for too many troops to defend them. Had France possessed a really modern system of fortifications extending from Verdun to the North Sea, she would have had a more effective mobile force at her disposal.

Each position presents a separate problem in fortifications. The general conditions to be fulfilled are that the works should be capable of developing an annihilating fire against an attack at close range up to the last stages of assault; they must support each other and cover the intervals effectively; they must be safe from capture by assault; and the enemy must find no cover in a captured work.

To fulfill these conditions, canister effect must be delivered against the flanks of an attacking force, by quickfirers and machine guns concealed and well protected by armor. In works possessing a rifle parapet the troops must be held in bombproofs during bombardment, and brought out only when actual assault is imminent. Much confusion may result from restricted passages and debris from enemy's fire.

The solution of the problem is to put personnel and matériel under armor. Men and machine guns may be put in an armored gallery, though concealment would be difficult. Machine guns may be put in individual armored positions and quickfirers in concealed turrets. Such a defense would be well concealed from view both from the front and from above.

The intervals must be covered by armored batteries of suitable calibers. Choice must be made between positions outside the main works where the batteries may be taken by assault, or in the works where concealment is difficult. The fire of these batteries should be reserved in order that their positions may remain concealed. They would be brought into action in connection with batteries in rear of the line when the attack has advanced to the main line of works. This use alone justifies the use of armor.

The main infantry defense should be made from a series of parallels, each covered by a profusion of entanglements, assisted by the armored batteries above described. Heavily armored observation stations would be required. The first defense should be in front of the entanglements, aided by small armored positions. A second stronger line in rear of the entanglements, and a final line still farther in rear completes the defense. The third is the main resisting line, strengthened by machine guns and quick firers under heavy armor, and to be defended to the last man. Auxiliaries such as barbed wire entanglements, charged conductors, deep ditch, ditch defenses, etc.. should be provided for the main works.

To prevent use of captured works by the enemy, they must be open to the rear. Ordinary passages to casemates must be closed up leaving access only through tunnels leading to the rear in the open. Enough space must be provided in the works to accommodate the full garrison. It is a mistake to count on relieving garrisons of works. This brings upon the scene men not familiar with the conditions of the moment, and thus weakens the defense.

The advantage in mining operations lies with the attack. The best scheme of defense seems to be to protect the works from below, and to surround the more important elements of the defense by a narrow, deep ditch filled with water.

Every advantage must be taken of the terrain to promote concealment of the works. A judicious use of trees and shrubs will contribute to that end.

The conclusion from the above is that permanent fortifications still remain a factor to be reckoned with. The better the plan and armament, the fewer men will be required for defense. The modern fortress will be feared by an enemy and form a staunch bulwark of the defense of the country.

See also

Dardanelles, Operations at the (1915) —Strength of Dardanelles fortifications

Fortress artillery

Siege artillery

Siege operations

—Permanent—Experience With in European War

[The Fortress in the Present War. By "Frobenius." *Kriegstechnische Zeitschrift,* Jan-Feb, '15. 5500 words.]

While the fortified strongholds of Belgium and France were being successfully crumpled up under the fire of the German artillery, military engineers have been asking themselves whether or not the fortress is necessarily an easy mark for the artillery.

It is true that the small, isolated fort is a thing of the past. The Franco-Prussian war has demonstrated this fact. France has since substituted for this class of works smaller fortifications and barrier forts along the railway lines which cross her borders. The weakness of the older type of works is three fold. Firstly, they are powerless to prevent the enemy's artillery from locating within effective range; secondly, they offer too conspicuous a target; and thirdly their artillery is no longer commensurate with that which the enemy can bring to bear upon them.

A certain group of fortified places, namely Lille, Laon, La Fère and Rheims were vacated in the present war without striking a blow. This was really due to a desire to augment the mobile forces with the garrisons rather than a lack of faith in the works. However, it is problematical how long a siege they could have withstood. On the other hand the girdle-forts of Namur, Maubeuge and Antwerp of-

fered resistance, but were reduced in from 7 to 12 days. The heavy artillery, of course, played the principal part in their reduction and capture. It may be of interest to briefly trace the course of events leading to the fall of each.

At Namur the Germans brought up 32 modern siege pieces which were placed in two groups at about 3 miles from the Belgium lines. These hammered away at a single sector of the defenses and were themselves well out of the range of the heaviest Belgian ordnance. The garrison clung to the trenches for protection without being able to answer the fire. It is an actual fact that Fort Maizeret only fired 10 rounds. It was itself struck by 1200 shells, fired at a rate of 20 a minute. This fort was on the left bank of the Maas. On the right bank and forming the northeastern sector were forts Cognelée and Marchevolette. Against these were directed the fire of the 42 cm. howitzers and the Austrian 12″ mortars. Fort Suarlée at the northwestern front was shelled from Aug 23 in the morning until it capitulated at 5 p. m. Aug 25. Three heavy batteries delivered against the work 3500 shells.

The siege progressed as follows: On Aug 21 the infantry moved against the outer lines and drove in all outposts. The fire of the forts slackened on Aug 22 when the heavy siege guns began to open up. On Aug 23 the infantry moved forward and the smaller field guns engaged the lines of communication between the forts. The artillery attack reached its height on the 24th, and Fort Maizeret surrendered. On the 25th the infantry pushed up between the forts and into the city. Five forts were silenced and the city fell on the 26th with the surrender of the last four forts. About 26000 of the garrison escaped the city, but were captured at Bois-les-Villers. This was the first appearance of the 42 cm. howitzers.

The features of this action were: the silencing of the inferior artillery of the defence; the destruction of all prominent structures of the forts; the forward movement of the infantry under cover of artillery fire; and the penetration of the intervals between forts. This last rendered unnecessary the actual storming of the fortifications. In referring to the inferior artillery of the defence it is comparatively speaking only. Suarlée and Cognelée had each two 21 cm. howitzers in armored casements, two 15 cm. and four 12 cm. guns. Maizeret and Marchevolette were each equipped with two 12 cm. guns and one 21 cm. howitzer.

At Maubeuge everything had been done to bring the defences to the highest point of efficiency. The forts were strongly reenforced with concrete and armor. The intervals were well prepared and an excellent first line of defenses had been thrown up. Entanglements were profusely employed. In addition to this an armored train was run over a track encircling the main line of defenses.

The German infantry under von Bülow moved on Maubeuge Aug 27, but did not take up the attack. The heavy siege pieces went into action Sept 3. Under cover of artillery fire, the infantry then moved up to within 2 km. of the works and sat tight. Three forts fell on Sept 6th and the city on the 8th. 40,000 men were captured.

The principal events of the siege were: the investment, the bringing up of heavy artillery, bombardment of the forts, forward movement of the infantry, attack on the intervals and eventual penetration at these points. The rapidity with which each phase followed the other is largely due to the superior range of the German guns.

Antwerp presents a unique condition inasmuch as the strength of the garrison outnumbered that of the besiegers by about three to one. The reduction of the extensive fortifications was quickly accomplished by the huge howitzers and mortars. It appears that the officer in command of the city could not have possessed any clear conception of the fundamental principles concerning the defense of a fortified place. He satisfied himself with a purely passive defense in contrast to the aggressive offensive of the Germans.

The forts were built along the lines laid down by Brialmont, namely, a great strength concentrated in a small space. They were defended in accordance with this same idea. The high angle fire of the large siege ordnance has proven the fallacy of this conception. Antwerp's only hope lay in preventing the emplacement of heavy artillery and cutting the lines of communication. Not even the work of the German engineers in bridging the flooded areas was energetically interfered with.

But now to return to the original question. The fortress is and always will be an easy mark for the artillery so long as the garrison permits the enemy's guns to approach within effective range and so long as they continue to offer conspicuous targets. This assumes, of course, that the besiegers are possessed of such siege matériel as the Teutonic allies now have.

The two all important phases in the defense of a fortified place will be: (1) the checking of the enemy's advance at a point well outside of effective range of his artillery and (2) minimizing the target offered by the permanent works.

The first condition can be brought about bv an unusually spirited action on the part of the garrison well in advance of the main line. This should be supplemented by the fire from the forts with long range guns. When it comes to size and weight of guns, the fortress has the advantage, for it can be fitted out with ordnance the like of which no army can ever hope to bring into the field.

The matter of re-enforcing old works with concrete and armor appears a hopeless task. The solution lies in another direction. Cut down the size of the structures, utilize natural features of the terrain and distribute the elements of defense over a larger area. Concealment must be sought at any price.

So far the only forts which have held out have done so by acting in conjunction with a strong mobile force. Brialmont stands to-day

FORTIFICATIONS—Continued

discredited. His idea of concentration of strength in single works has proven a failure. Our preconceived notions must be reversed. We can no longer rely on the strategical value of fortifications alone. In the future the post must be fought in close co-operation with its reserves, a mobile body of troops placed outside of and well beyond the lines.

[Modern Fortifications and New Means of Attack. Capt. Edoardo Tacconi, Italian Engineers. *Rivista di Artiglieria e Genio,* Apr '15. 7000 words. 1 plate.]

The habitual use of heavy mortars is the most striking feature of the present war. It may be noted that some of the photographs purporting to show the effects of heavy projectiles upon the Belgian fortifications give the appearance rather of a magazine explosion than of the effect of a projectile; but it seems undeniable that present types of works, whether steel or concrete, can not resist the attack of such guns.

The quick fall of the Belgian fortresses suggests that they may not have been properly prepared. It is probable that neither the forts themselves nor the works in the intervals were fully manned and ready for action. Their guns, too, seem to have been old and of range inferior to those of the attack, which were effective at 10 or 12 km.

The immediate changes in fortification types will probably not be the same for barrier forts in the mountains and for fortresses in lower ground. Hitherto types of batteries have been much the same, but the increase in power of the attacking artillery alters the situation. Increase of protection might be possible in the plains, but in the mountains safety must be sought in better use of the ground. It is objected that sites for works in the mountains are few, on account of the bleakness of the climate, and on account of atmospheric conditions interfering with fire; but where a mobile force like the Alpine troops can work a fixed garrison can certainly live, and indirect laying helps to solve the second difficulty. The requisites for a mountain fort seem to be a site of high command, complete defilade, and division into small elements well dispersed. Even aerial observation would be difficult against such works, where shrapnel fire upon a wide zone is useless; and observation from stations on the ground would be almost impossible.

The dispersed elements of the battery should usually be behind a crest. Only the minimum supply of ammunition should be kept near the guns, and this in deep bombproofs with covered connecting galleries. Heavy armor is unnecessary, since the defilade and height of site render it difficult to reach the works with any kind of shell fire: only protection against shrapnel and shell fragments is required.

Everything outside of gun emplacements should be cut into the solid rock. Quarters for the garrison must usually be above ground; but they should be of light construction, and placed on the reverse slope behind natural or artificial walls of solid rock, any slopes above being provided with walls capable of turning rock masses dislodged by shell fire.

The guns of such a work would necessarily use high angles of departure, and would have great dead space; but these works are intended to fire only upon distant targets, and the protection of their immediate front belongs to the secondary armament and to the artillery of the mobile defense.

Where such construction is impracticable, a system of casemates, or, better, rock galleries, with minimum ports, is suggested. This system lacks the field of fire of turrets, but has advantages in that it is vulnerable only by high-power flat trajectory guns, which are limited by considerations of weight to smaller calibers than howitzers. And 360° fire is useless; embrasures may be so constructed as to give 90°. If this were insufficient the embrasures might be directed upon different targets, and each gun might have several embrasures; quick shifting should be practicable nowadays.

In level country the problem is more difficult; it reduces to the old contest between gun and armor. Perhaps new ground must be sought; the fortress of the future may consist simply of a large area so organized as to permit troops and guns extraordinary mobility. Elaborate road and railway systems, and highly mobile gun-mountings, would permit of shifting and reorganizing batteries at will. Permanent works could probably not be dispensed with entirely, but would be placed only at particular points, with the primary intention of compelling the enemy to lose time in bringing up the heaviest of siege guns. This combination means definite separation of the functions of near and distant defense, but this seems clearly necessary in view of the experience of the present war. The permanent works in this system should simply protect the intervals; mobile batteries of heavier guns should take care of the enemy's long range artillery.

[Some Opportune Observations Concerning Armored Fortifications and Other Matters. By Maj. B. Schmidt-Reder (Marsyas). German Army. *Artill. Monatshefte,* June, '15. 3500 words.]

Although it is too early to form conclusions based on the experiences in the present war, it is possible to note some tactical tendencies. These are determined chiefly by the relative strength and armament of the opposing sides and the peculiarities of the terrain. Tactics will change according to the development of new scientific appliances. For instance, aero-reconnaissance is of decisive importance in determining tactical disposition for reconnaissance and combat. For field artillery, which formerly held a position as long as possible, the rule now is to change position as soon as discovered by aero reconnaissance. The French do this consistently. Masked positions have lost many of their for-

mer advantages. In the beginning, the importance of every new appliance of warfare is over-estimated. It was believed that cavalry reconnaissance had become unnecessary and futile. Experience in the present war shows, however, that aero reconnaissance merely augments cavalry reconnaissance, and that the former fails completely when weather conditions are unfavorable.

In this war, armored fortifications have also shown themselves unable to resist the power of modern heavy guns. Strong and expensive fortified places, such as Namur, Liége, Antwerp, and Maubeuge have succumbed in a few days. But the claim that all fortifications are useless is far from correct. The war has simply shown that some old principles concerning armored fortifications no longer apply, while others are emphasized. Not all fortifications have the same strategic importance. Some fortifications are almost sure to form a part of military operations. Others are of secondary importance and may have to be evacuated without a struggle, as for instance Rheims in the present war. Such fortifications become an expensive luxury. In fortress warfare, the defense is always the weaker; the contrary is the case in field warfare. This is shown by the effectiveness of the aggressive defense of the Germans on the western front. The weakness of all armored turrets lies in the concrete foundations upon which they must be built and the vulnerability of the operative machinery, to disturb which direct hits are not even necessary. It is quite proper to assume that in the constant contest between gun power and armor, the gun will always win out. The limit of the possible has by no means been reached in the manufacture of large caliber guns. Improvements in motor traction have made possible an adequate mobility.

Although guns have maintained their superiority over armor, the use of armor in the future cannot be renounced, because it is necessary for certain guns distributed in small groups at important points (not necessarily in the firing line) where the terrain gives advantageous cover. The concentration of armor and guns in unit fortifications merely simplifies the task of the opposing artillery. This type of fortification should therefore be used only in places where the character of the terrain is such as to make it impossible for the attack to use its heavy artillery, but on principle armored guns should never be placed in forts. All fortress guns must be provided with protective shields. They should be located according to the advantages of cover offered by the terrain, with wide intervals. The strength of the armor should be such as to withstand direct hits from guns of 15 to 21 cm. caliber.

[Remnants of War. By José Paulo Fernández, Captain of Artillery. *Revista de Artilharia*, July, '15. 2400 words.]

The vastness of the fields of battle make a complete history of the war impossible at the present time. The lessons taught by the Anglo-Boer and the Russo-Japanese wars are of little value in the present conflict.

In one action on the left flank of the French line, the English expended as much ammunition in fifteen days as they did in the whole Boer War. Adjectives with which to describe and classify what takes place on the battlefields are lacking.

"Remnants of War" is the title given this article, as "Remnants" is the only word to express the true meaning.

Liége with twelve forts, Namur with nine, Antwerp with thirty-two, Maubeuge with six, Lille with six, and other though less known fortifications. However, these latter were none the less important. Jaroslav, over the San, in Galicia, stronger than Liége and Namur, but which offered less resistance. Were these not the best types of present fortifications? What was the effect of these fortifications? Some of them offered slight resistance before they were destroyed. In a word, they all failed of the purpose for which they were constructed.

They failed in the greater part because: (a) of superiority of artillery brought against them; (b) of the lack of offensive spirit among the defenders. The most of these assumed an attitude purely defensive and passive.

The Germans and Austrians depended not only upon the size of their artillery or the size of the projectile, nor upon the destructive power when the projectile struck. They counted also upon a powerful detonation to produce a moral effect which was of greater value to them than the destruction wrought.

It has been conclusively proved that the Germans had for a long time before the war been constructing platforms of cement at convenient points to accommodate the materials with which to reduce these fortifications which would impede the progress of their armies. "Is this significant?"

Another aspect of permanent fortifications is that they must be rejuvenated every so often, in order to keep pace with new armament. Their greatest fault is, however, that they kill the offensive spirit of troops, as they come to rely upon these fortifications to the point where they offer less resistance than would naturally be expected of them.

Military training which does not inculcate the spirit of the offensive is a failure. An army so trained will become inert.

The Belgian people were educated and trained in the school of defense. The attitude of the nation was passive and all their faith was placed in their permanent fortifications. The Belgian Army could not have existed without its fortifications, and these could not resist the offensive energy of the invaders.

General Joffre was the great authentic judge of the value of permanent fortifications in war. He realized that they were better than nothing. At the same time he determined, if the necessity came, to abandon the fortifications of Paris and maintain his armies in the field.

The real force in war is movable artillery and a mobile army

FORTIFICATIONS—Continued

Troops trained for the defensive in strong forts are inactive and without initiative. The forts of Belgium and Russia prove this beyond the shadow of a doubt.

The many projects for National Defense almost all include gigantic fortresses. Let us retain and use the forts which we already have, but let us make our mobile army active and aggressive.

Let us invest our money in Artillery.

—Permanent—Strategic Value of

[Influence of Fortified Places in the Great Wars and in the History of the 19th and 20th Centuries. By Mario Papone, Capt. Engrs. *Riv. Mil. Italiana,* May-June, '15. 36,000 words.]

The function of a fortress may consist merely in stopping the enemy under its walls, or in increasing the offensive capacity of a mobile army, with many gradations between these two, depending upon the scope of the war, the technique of combat, and the relation the fortress bears to a particular military and geographical situation.

Since the introduction of artillery, the technique of combat has constantly progressed. The art of fortification has also progressed, but has generally lagged behind the development of the weapon.

Fortresses of the Napoleonic Period:

In the reorganization of society after the French Revolution the army, which had formerly been the instrument of the dynasty for the conquest of territory, became a national instrument used to annihilate the army of the enemy. The attack and defense of fortresses had formerly been the chief purposes of field operations.

Napoleon used fortresses to protect magazines, hospitals, recruiting depots, convoy stations, and the like. The disaster to Mack at Ulm resulted from adherence to the old method of keeping an army in a fortress. The same lack of understanding of the changed conditions of warfare contributed to other defeats of the Austrians and Prussians by Napoleon.

When Napoleon's star began to set and he stood on the defensive, he used fortresses as maneuvering points from which to throw his army against the enemy. Dresden served in this way, allowing him to pass rapidly from one side of the Elbe to the other. But the insufficiency of the fortifications of Dresden limited his freedom of action and prevented him from inflicting decisive defeats upon the enemy.

Napoleon considered Italy a secondary theatre of operations in the war with Austria in 1805. He attributed great importance to the Italian fortifications. He could not spare men to garrison them, but he proposed to cover them by the operations of the field army, and to use them to facilitate and protect the movements of his army. He considered that fortifications, like cannon, were arms that could accomplish nothing of themselves, but required to be well handled. He looked upon them as obstacles in the way of the enemy; as aids to a small force, enabling it with safety to inflict losses on the enemy; as fixed points which establish a position to be held; and as places where reinforcements may be awaited. In his opinion they assisted the action of an army, but were not a substitute for such action; they offered a temporary advantage that must be used at the proper moment; after this moment passed their influence became less favorable and might even become harmful.

A fortress located on a river is like a bastion that flanks the curtain. Instead of flanking it with fire, the fortress flanks the river with the maneuvers of a mobile army.

When the enemy has crossed the river and maintains a number of bridges, the fortress has nothing further to offer to the field army. Three possible courses are open: to give battle under disadvantages; to retreat before the enemy; to retire into the fortress. The first two require quick action and may lead to disaster or to the salvation of the army; the third postpones the result, but makes it no less inevitable.

At the beginning of the campaign of 1814 Napoleon had to decide whether to abandon the network of French fortresses on the eastern frontier or to garrison them. He decided to garrison them. This took from 130,000 to 150,000 men, mostly local militia, but weakened his field army. His troops lived on the country, and supplies were collected and stored in fortresses, from which they went forward to the army or to secondary bases established as the army advanced.

Between the bases and the army there was a chain of fortified posts for the protection of convoys. The development of railroads has greatly simplified the problem of communications since the time of Napoleon.

The Italian Quadrilateral:

Between 1815 and 1848 the bastioned trace was replaced in Prussia and Austria by the polygonal trace, which gave a large development of frontal fire. A line of detached forts in front of the enceinte was also introduced. This was the origin of the "intrenched camp."

The importance of the region between the Mincio and the Adige became evident between 1796 and 1814. The fortresses of Verona and Legnano on the Adige and Peschiera and Mantua on the Mincio guarded the pass between the Lago di Garda and the Po River. Napoleon, who despised fortresses, was delayed by the fortress of Mantua from June, 1796, to February, 1797. The quadrilateral played an important part in 1809 and in 1813-14. In 1848 during the first war for Italian independence, the quadrilateral was relied upon to block the valley of the Po, to serve as a redoubt for the Austrian army in case of surprise, and to serve as a gateway for the principal forces issuing from the center of the monarchy. Very little improvement had been made in the fortresses since Napoleon's time. Verona had a simple continuous bastioned enceinte, with only one advanced work and poor artillery. Mantua had a continuous enceinte on the south-east front with a wet ditch; it had several advanced works on this and other

fronts and was adapted to defense by inundation. Peschiera was well adapted to passive defense; it had two advanced works, not well supported by other works. Legnano was a double bridge-head on the Adige. Verona was the most important point in the system.

The Austrian army was inferior in numbers to its opponents. Its first stand was made on the Adige, but to avoid loss of men Radetsky retreated on Peschiera and Mantua, where he awaited reinforcements. The Italians besieged Peschiera, and when the Austrian reinforcements reached Verona they were not free to seek the Italian Army in the field, but felt obliged to create a diversion for the relief of Peschiera. In this way the fortress was a detriment to the field force, whose proper objective should have been a small Italian force near Vicenza that could have been crushed. And the diversion failed, as Peschiera fell during the progress of the movement.

The Austrian Army was further strongly reinforced and resumed the offensive, moving upon Vicenza by way of Legnano. This offered an opportunity for the Italians to capture Verona, but they failed to do so on account of indecision and delay. The battle of Custozza terminated the function of the quadrilateral.

This campaign shows that the fortresses played an important part in the maneuvers of the field armies, instead of being mere isolated strong points, as they had generally been regarded in the previous century. At the same time it was the skill of Radetsky in knowing how to utilize the fortifications, that made them of such great service to the Austrians.

The quadrilateral served the same purpose in the war of 1859 as in 1848. After the peace of Villafranca it became a frontier system of fortresses. On account of the improvements in artillery the character of the works was modified by the construction of additional detached works located farther from the enceinte. A bridge-head with four forts was constructed at Pastrengo.

The war of 1866 in Italy may be said to have begun and ended with the battle of Custozza. Italy operated as the ally of Prussia. Von Moltke thought it was better for the Italian army to attack the Austrians in the field than to besiege the fortresses. His plan was to have the Italian army advance across the lower valley of the Po, cut the eastern communications of the quadrilateral, surround Venice, and move into Austria. This plan, while favorable to Prussia, appeared to the Italians dangerous to Italy. They were numerically superior to the Austrians, so they decided to attack from two directions, west and east.

The Archduke Albert with the Austrian army had an interior position and could oppose either of the Italian forces as he chose. He decided to oppose the one coming from the west. The fortresses and the rivers enabled him to mask his movements, and to select the battleground. The quadrilateral preserved its reputation of being unconquerable. This battle marked a new era in war, by the active part taken by the fortresses in aiding the mobile army.

Sebastopol

The political object of France and England in the Crimean war was the preservation of an equilibrium of influence in the Turkish Empire. The military object was the capture of Sebastopol, a maritime fortress weak on the land side. In Sept. 1854, 61,000 English, French, and Turks landed, unopposed. At the Alma they defeated 33,000 Russians, who withdrew toward Sebastopol. By the exertions of Todleben works were constructed on the rocky soil. The place was strongly armed, having 800 fixed guns and 931 as a mobile reserve. Its garrison was at first 19,500 and later 35,000. The Allies finally had 219,000 men men and 520 siege guns. Not counting losses due to cholera, the campaign cost the French and English 64,000 men and the Russians 128,000, figures out of proportion to the military importance of Sebastopol. When captured, it was a mass of ruins. The principal result accomplished was the destruction of the Russian fleet.

Metz

In 1870 the French fortifications, except those of Paris, were out of date. The importance of Metz as a point of support for an army that might meet a reverse on the Alsace-Lorraine frontier, had been recognized, and work had begun on the construction of an enceinte with detached forts, but at the end of July, 1870, the work was far from complete. The place had three fixed bridges over the Moselle, but many more were needed to afford free movement to an army crossing the river. After the defeats of Woerth and Spicheren, the French planned to retreat to Chalons, but non-military considerations caused the emperor to change the plans and fall back upon Metz. For several days there was much indecision in the French councils and a failure to take advantage of opportunities for favorable action against the 1st German army. The emperor left the command of the French army to Bazaine who finally crossed to the left bank of the Moselle. The proximity of the fortress appeared to have a bad influence on Bazaine, causing him to lose initiative and waste time in inaction. He interrupted the retreat and took position at Gravelotte-St. Privat. Defeated there, nothing remained but for him to retire within the fortress to refit his army. When this was done he attempted unsuccessfully to break out and finally surrendered, with 173,000 officers and men. The lesson of Metz shows not a lack of judgment, but a lack of will. It will not do in war to be governed always by circumstances; it is sometimes necessary to oppose, overcome, and dominate circumstances.

Paris and the French Forts in 1870.

Important political centers are vulnerable points and must be fortified in order to give the field armies freedom of action. Paris, unfortified in 1814, had a harmful influence; in 1870, fortified, its influence was favorable.

The Germans expected Paris to yield to starvation after a short siege. For regular

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siege operations Von Moltke ordered siege equipment to be shipped to Paris. Three railroads entered Paris from the east, each passing through one or more fortified points. These small forts had to be reduced before the siege equipment could arrive. Even after one of these railroads was opened, it was used almost to capacity for shipment of provisions. This caused great delay in the siege operations, and caused Von Moltke to say that the decision of the campaign rested not at Paris but in the defeat of the French armies still in the field.

The resistance of Paris could not change the result of the war, but such a prolongation of a war has great political consequences. At the present day the great size of armies makes war very costly, and a prolongation of the struggle for several months means a great increase in expenditure of wealth and energy. In this way, fortresses such as those of Paris and the smaller places that blocked the railroads may exert a great influence toward ending the war and deciding terms of peace.

Port Arthur

The Siberian railroad gave Russia the means of using all her forces in either a European or an Asiatic theater, as might be necessary. It also threatened the influence of Japan in Korea and China. In 1898 Russia secured from China a 25-year lease on the south end of Liaotung peninsula with Port Arthur and Talienwan, the best ports in Manchuria. Russia also secured the right to connect these ports with the Siberian railroad, thus securing an ice-free outlet to the sea. The immediate object of Japan in her war with Russia was the definite separation of Port Arthur from Russian territory, and the object of Russia was to maintain the connection. The siege of Port Arthur was therefore a return to the period of warfare in which the capture of a fortress was an end in itself. The Japanese first attacked the Russian fleet, destroyed some ships, and drove the remainder into the harbor. An army was then landed and the fortress was invested, in May, 1904. There was considerable correspondence between Gen. Stoessel, commanding Port Arthur, and Gen. Kuropatkin, the former claiming great lack of provisions and munitions and urging the importance of relief for the fortress, and the latter urging a defense to the last extremity. The viceroy Alexieff, in supreme command of land and naval forces in the Orient, reported the situation to the emperor, who telegraphed at length his views as to the importance of sending aid to the fortress, concluding with the statement that he would hold Gen. Kuropatkin directly responsible for the fate of Port Arthur. A relief expedition was sent, but was so hampered with precautionary orders that it accomplished nothing.

The fortress surrendered Jan. 2, 1905. Events showed that Gen. Kuropatkin was correct in his estimate of the situation as to the absence of urgent need for relief in the early days of the siege. Viewed in relation to the entire campaign, Port Arthur was an important element in favor of the Russians. It enabled them to gain time, which they greatly needed. In its importance as a feature of the war, it resembled Sebastopol.

Adrianople

Adrianople was hurriedly fortified at the time of the Turko-Russian war of 1877-8. About 1909 it was modernized, with a view to its importance relative to the concentration of troops in case of war between Turkey and Bulgaria. When the war with Bulgaria came on in 1912 the Turkish troops were concentrated between Adrianople and Kirk-Kilisseh. This territory had the disadvantages of being too extended for the available forces and of not being well situated for the defense of Constantinople. The Turkish commanders therefore reduced the front and concentrated in the vicinity of Kirk-Kilisseh where a retreat, if necessary, would lead toward Constantinople. Adrianople was left with a garrison of about 45,000 men, not well instructed, but well commanded and well supplied with provisions and munitions. The place was besieged from November, 1912, to March, 1913, by a force of varying strength, averaging possibly 60,000. It therefore served to occupy the attention of about one-third of the Bulgarian army with a smaller number of Turkish troops, most of them not capable of good service in the field.

Development from 1870 to the Present Day.

Rifled guns, increased ranges, and indirect fire have made the modern fort an intrenched camp, with detached forts 4 to 5 km. from the nucleus, and 2 to 3 km. from one another. The guiding principle is the separation of the elements of the distant defense from those of the near defense. Large caliber guns are placed in the intervals, and removed by night if located by the enemy. Flank defense pieces are in the forts and consist of machine and quick-firing guns. A fortress may be considered as an army whose power of combat has been greatly increased by the construction of a mass of works.

—Use of in Civil War (U. S.)

[The Development of Field Fortifications in the Civil War. By Capt. W. C. Johnson, 26th U. S. Inf., and Capt. E. S. Hartshorn, 3d U. S. Inf. *Professional Memoirs,* Sept.-Oct., '15. 14,500 words.]

No finer examples of the use of fortifications by armies actually in the field are to be found, even in the most recent times, than in the later campaigns of the Civil War—the very war in which this idea is believed to have been born. To the initiative and intuition of the private soldier is due in no small measure the remarkable growth of "hasty entrenchments." His appreciation of the shelter of even a log or a scooped-out hollow, coupled with his inventive genius, resulted in a marvelous skill and rapidity in intrenching.

The first use of fortifications prepared by the defensive in the field was at Big Bethel, June 10, 1861, by the forces under Col. Magruder. The untiring industry of Col. D. H. Hill's regiment in intrenching their position is

said to have been responsible for the early repulse of a superior force.

To oppose the passage of McClellan's forces in West Virginia, the Confederate troops under Garnett constructed an elaborate system of works covering the Laurel Mountain and Rich Mountain passes. On account of the narrow fronts occupied, the Union troops had no difficulty in turning these positions in a few hours —thus demonstrating the futility of expending much labor on works not adapted to meet conditions.

Shiloh furnishes a glaring example of "what might have been" in this connection. Despite the known presence of a superior force in the vicinity of Grant's army, absolutely nothing was done toward strengthening the Federal position beyond reconnoitering a line for defense. Years afterwards, in their memoirs, Grant and Sherman, who had both become past-masters in the use of field fortifications, evidently realized that the Federals were at fault in not preparing their positions. In contrast to this campaign stands out Halleck's later advance on Corinth, in which nearly every foot of the twenty-mile advance was contested for a month.

In the east, the Peninsula Campaign furnishes the first extensive application of field works. Magruder's Yorktown line, which delayed McClellan for one costly month, was of a more or less semi-permanent nature, with dammed waterways, gun pits, rifle trenches, and abattis; altogether, 11 miles in length. No determined attack was made on these lines, at first lightly held—a fact which strongly indicates the moral effect as the chief deterrent to McClellan's progress. In general, the Confederates made skillful use of entrenchments throughout this campaign; at Williamsburg, where they unhesitatingly left their trenches to assume the offensive when the opportunity came, and later before Richmond, where Magruder's 17,000 held off by their clatter four times their number, while Lee marched to smash Porter astride the Chickahominy. As the initiative now passed to the Confederates, the Union fortifications assumed an increasing importance. They enabled Porter to hold out the entire afternoon against Lee's flank attack, with one-fifth of his opponent's losses. Again at Gaines' Mill the next day, the hastily constructed breastworks of felled timber, rails, knapsacks, and rubbish were of great assistance in holding off the enemy's superior numbers. This was perhaps the first time the Army of the Potomac made use of such impromptu works erected by troops deployed and waiting for an attack. The lesson, however, was not yet learned, and in the succeeding actions at Frazier's Farm and Malvern Hill, practically no attempts were made to fortify. Nor did the following campaigns of Manassas and Antietam disclose any developments in the art of fortification. Fredericksburg afforded a demonstration of a position already fortified in the sunken road at Marye's Hill, which needed scarcely any improving to be well nigh impregnable.

Chancellorsville is of interest as being the first great battle of the war where field works were used extensively by both sides. Hooker's use of them was very faulty, to be sure. After Jackson's flank attack had succeeded because Hooker's right was in the air, a second line was fortified, the right flank of which was still exposed. From the third line finally occupied, with both flanks on the river, "probably the strongest field entrenchments ever built in Virginia," Hooker made the great mistake of withdrawing without awaiting battle.

In the west, the leaders had earlier recognized the importance of field works, and their development was more rapid. At Murfreesboro, where only the Union left was entrenched, the unintrenched portion of the line had been rolled back about this portion as a pivot, and the whole army probably saved from a crushing defeat by this stand. Again at Chickamauga, it was the entrenched corps of Thomas, "standing like a rock," that maintained itself undefeated, though the other parts of the line were beaten back around it as a pivot.

Substantial progress in the art of entrenching was evidenced at Chattanooga. All reports of the higher commanders mention, as a matter of course, the building of breastworks, and Sherman's reports indicate that his men, in their flank attacks, entrenched three lines within twenty-four hours, each position a little further advanced. The action on Missionary Ridge furnished an example of the *failure* of field fortifications, a failure the lessons of which are plain and important. It illustrated the defect inherent in a double entrenched line, in that the troops retiring from the advanced line mask the fire of their supporters and tend to spread panic among them. Furthermore, it pointed out the difficulty of selecting a line along a steep broken slope without leaving dead spaces—in this instance there were many ravines uncovered by the poorly located Confederate line.

The Atlanta campaign resulted in the most extensive use of field works yet met with in warfare. An inspection of the route of the armies discloses a series of massive and elaborate Confederate works, and in contact with these the less extensive but more skillfully placed trenches of Sherman's men. This supports the theory that the best trenches are those built under fire and by the troops who are to occupy them. In his memoirs, Sherman speaks of the "continual battle in progress by strong skirmish lines, taking advantage of every species of cover, and both parties fortifying every night by rifle trenches with head logs, many of which grew to be as formidable as first-class works of defense." Lines were advanced and intrenched under fire, working parties being protected by very strong lines of skirmishers to keep down hostile fire; regular saps and approaches, however, were not resorted to. Sherman even organized a pioneer corps of "dirt diggers" of freed slaves. In the operations around Kenesaw Mountain, 75 miles of field works were constructed by his men. The assault reluctantly ordered by Sherman

FORTIFICATIONS—Continued

against the strong hostile position here was a failure, and, indeed, the whole Atlanta campaign demonstrated the "folly of direct assaults against such positions." Reports show that at this time the axe was the tool for hasty work. Average penetration of a bullet in pine at 500 yards was only six inches, so a breastwork of sufficient thickness was readily improvised.

Returning to the eastern theater, we find both armies in the last great campaign in Virginia showing a full appreciation of the value of field works. They never halted without covering themselves,—after three years, the lesson had been learned. The preliminary operations around Petersburg deserve notice here for the Confederate line, so weakly held at first, consisted simply of a series of supporting points, 200 to 400 yards apart, without curtains. Thereafter the city speedily became a fortress, and it was only by turning the extended lines, not by carrying them, that the Union troops finally rendered the place untenable.

The lesson of all this, reinforced by recent wars, is that practical instruction in the use of field works should be increased to keep pace with the improvement and increased supply of intrenching tools. In particular, a practical course in field fortification should be included in the Garrison School for Officers.

FORT RILEY MOUNTED SERVICE SCHOOL

[Mounted Service School. Editorial. *Army & Navy Jour.* Oct. 9, '15. 600 words.]

The Secretary of War has disapproved the recommendation to move the Mounted Service School from Fort Riley, Kansas, to Front Royal Remount Station in Virginia. The Secretary is of the opinion that Fort Riley is the best location, being at a central point. The terrain is suitable for the desired training, and there is an absence of the distractions from work that would be found at an eastern point. Non-commissioned officers of field artillery as well as cavalry will be trained at the school. Junior captains or first lieutenants nearing promotion will be detailed for the first year's course. Field artillery and cavalry officers serving in the United States and Hawaii will be eligible for detail. Due to the demands of Mexican border service, the second year class will be reduced next year to five, to be again raised to ten when conditions permit.

FORTRESS ARTILLERY

See also

COAST ARTILLERY
FORTIFICATIONS—PERMANENT
SIEGE ARTILLERY

—Firing Regulations

Austria

[Changes in the Austrian-Hungarian Firing Regulations for Fortress Artillery. By Major Wilhelm Knobloch. *Schweizerische Zeitschrift für die Artillerie und Genie,* May, '15, 1000 words.]

This article takes up mostly changes in nomenclature, commands and minor details.

It appears that formerly the first trial shots from mortars and howitzers were eliminated from consideration in establishing firing data, due to supposed erratic behavior, but this practice has been abandoned.

High angle fire pieces are furnished a certain number of "illuminating shrapnel," the exact nature of which is not disclosed.

Datum points are used for the registration of guns and howitzers. These points are used as aiming points wherever possible.

The battery commanders are warned against making too small corrections, and emphasis is laid on the desirability of a large bracket.

—Recoil Devices

[Captured Materials of War. Editorial. *Kriegstechnische Zeitschrift,* Jan-Feb, '15. 1300 words. 1 illus. 1 diagr.]

Captured weapons are always of interest to the soldier, but especially so to the ordnance expert. What the enemy has succeeded in keeping secret during times of peace suddenly becomes an open book.

An especially interesting trophy is an English 10" naval piece which was intended for mounting at Antwerp. It arrived, however, too late to be of any assistance in the defense of that city. Its mounting varies from the usual practice inasmuch as the gun rests in a cylindrical cradle and has two recoil cylinders, one on each side and on a level with the axis of the bore. This system has the advantage over that with the recoil cylinders below the gun inasmuch as the shock of recoil does not throw any stress on the elevating mechanism. It has, however, some disadvantages. Firstly, the mount is not suited to every form of fermeture and then again it does not allow much freedom in its mounting on board ship. The breech hoop carrying the piston-rod lugs must necesarily be very heavy. Another objectionable feature is that the overall width of the carriage is greatly increased.

A peculiar element of this mount is the use of the recoiling system for supplying compressed air to the chamber scavenging device. The recoil piston rods are extended beyond the front end of the recoil cylinder and into the air compressor. In recoil, air is drawn into the compressor reservoir and there compressed to a high pressure by the action of the piston rods in counter-recoil. The connection between breech and compressor is established by a series of tubes which telescope one into the other for an amount equal to the length of recoil.

Still another interesting feature is the use of roller bearings around the trunnions. This expedient for facilitating the operations of depressing and elevating, however, is not considered to be a very practical solution of the problem. The disadvantages are obvious and many.

—Reconnaissance

[The Service of Observation and Reconnaissance in Attack and Defense of Fortified Places, as Affected by Modern Equipment and Methods. (Gold medal essay, 1914.) By Lotario Alfredo Mansella, Captain of Artil-

lery. *Rivista di Artiglieria e Genio.* Jan., 1915. 20,000 words.]

Even in serious matters, there is such a thing as fashion. Perfectly logical and evident ideas are neglected because the style runs to something different.

There was a time when, in the firing exercises of fortress artillery, everything was simple and easy—batteries stationary in the open, targets large and visible. Then came wheel girdles, permitting batteries to move more easily. The first effect was to lead heavy batteries to imitate field tactics; this soon passed, and they contented themselves with slower movements.

This idea going out, a new style came in. Being able to choose their positions, batteries naturally took cover; logically, the targets also disappeared; no new laying apparatus having been devised, the fashion ran strongly to systems of observation and reconnaissance, to the neglect of everything else.

With improved laying apparatus, elaborate preparation of fire came into fashion; everyone forgot about tactical verisimilitude, in the location of either batteries or targets, and reconnaissance also became old-fashioned.

New equipment and methods have been developed for this service; perhaps a better balance may now be established.

The means available for this service in siege warfare are aircraft, aided by wireless telegraphy and photography; self-contained range-finders, goniometers, hyposcopes and other optical instruments suitable for observation stations; and exploring patrols, availing themselves of visual signalling, panoramic sketches, etc.

Aircraft at once divide themselves into two classes, dirigibles and aeroplanes; the first adapts itself to the atmosphere, the second overcomes it by force.

The larger dirigibles are capable of a speed of 70 km. per hour, or 20 m. per second. They cannot, of course, make head against a wind of that velocity, but must allow a margin of safety, especially as the mean or measured velocity of the wind is not the maximum velocity—perhaps 12 m. per second is the strongest wind with which they can contend, even with all conditions favorable. In examining reports of operations by foreign airships, it is impossible to determine accurately what the atmospheric conditions were. It is evident, however, that these craft are very much at the mercy of the weather, and that there are many days when it is impossible to ascend at all; the Italians used two of them in Libya, but found that they often had to remain inactive for long periods. On one occasion a storm, which destroyed the hangars, kept them out of action for three months. These machines cannot be anchored in the open; and they require great and elaborate establishments to maintain them.

They are also very vulnerable. French experience goes to show that rifle fire will reach them at 1500 m. altitude, and machine guns at 2000 m. If no vital part is struck, such fire cannot bring them at once to the ground; they will have time to reach a safe place to land. The Italian dirigibles in Libya, on account of the heat, which diminished their lifting power, and of the heavy loads they carried, were compelled to work at an average height of 1200 m. Their envelopes were struck by bullets about 100 times, and other parts 30 times. This was not a negligible result, considering the poor marksmanship of the Arabs; they even succeeded in getting adjustment in direction with field pieces, and the crews say they would undoubtedly have been hit if the enemy had known how to manage their fuses. In Italian experiments in 1914, a special balloon gun could always adjust quickly and accurately upon a balloon only 3 m. in diameter, towed by a torpedo boat, at a range of over 4000 m. A field battery obtained similar results against a balloon of the same size liberated from a station 6000 m. distant. The new Italian Deport field gun seems to be able to take care of any dirigibles.

Speed is one of the elements of safety in any aircraft. In the aeroplane speed increases in direct proportion to the power of the motor; in the dirigible, only in proportion to the cube root of the power.

The other element of safety is altitude. Here increased safety means diminished power of observation. Besides, the maximum practicable altitude for dirigibles seems to be about 2500 m. (although some of the latest hope to reach 4000 m.); here they would be safe against small-arms, but not against artillery.

Observation from a dirigible should be very good; observers agree that the country can be studied with absolute clearness, as on an accurate map. But at safe altitudes this map would be on a very small scale, and it may be doubted if the information that is really wanted could be thus obtained. General reconnaissance at long distance may be a better field for them, for under favorable conditions they can keep the air for long periods.

Observation is useless without reports; dirigibles being comparatively slow find difficulty here when the objects under observation are not fixed or nearly so. Efforts are being made to devise an appropriate signalling system; wireless telegraphy suggests itself, but the difficulties and dangers of mounting such apparatus on a bag of hydrogen are obvious.

Photography is extensively used in reconnaissance from dirigibles; but even when the pictures reach their destination in time to be of use, the technical difficulty of producing from a safe height, a photograph which accurately represents the ground, is very great.

Dirigibles seem to offer possibilities for offensive action, by dropping heavy charges of explosives. This is an interesting question for discussion, but is without the scope of this essay. Another interesting possibility is offensive action in the air, against other aircraft; but again the bag of hydrogen is an unpleasant neighbor for gunfire. As for defense against an aeroplane, a dirigible

FORTRESS ARTILLERY—Continued

should be able to get out of its radius of action before it can rise high enough to attack from above, since the aeroplane has to climb by a series of circles; this, however, still implies defeat for the dirigible.

The aeroplane has numerous advantages over the dirigible in its practical applications. It also has the great advantage of being easy to transport and supply. Its principal advantage defensively lies in its great speed and small size. As for observation from such a machine, flying at an enormous speed, the difficulties are obvious, even if the observer is an expert and has a separate pilot. Remarkably fine results have been obtained in manœuvres; the experience of the Balkan wars, however, and that of the Italians in Libya, warns us not to be too optimistic.

One special problem of direct interest to us is the reconnaissance of targets and observation of artillery fire, in which good results have already been obtained in experiments. The speed of the aeroplane permits the results of observation to be communicated to the battery in a short time; for cases where even this time is not available, methods of signaling, by wireless and otherwise, are being tried.

What has already been said of photography from dirigibles may be applied to aeroplanes; so also, to some extent, of offensive action. Some effect may doubtless be obtained with either bombs or machine guns, from an aeroplane, but it is impossible to calculate upon it beforehand. Action against dirigibles offers better prospects than against ground targets.

One more means of aerial reconnaissance remains to be mentioned—captive balloons. In spite of their obvious disadvantages, good use may be made of them in special cases.

Returning to earth, we have given first place to range-finders and goniometers. These have hitherto been used almost exclusively in direct connection with firing, but they may be made equally useful in the broader fields of reconnaissance, mapping, etc. The two instruments should be combined, so that a single observation may locate a point by polar co-ordinates.

Taking up, finally, the subject of patrolling, the first point to be considered is rapid transmission of information. Various methods of visual signaling solve this problem in part, especially the use of the triple mirror described in the appendix. Panoramic sketches are very useful to patrols, but much skill is necessary to make such sketches with the requisite simplicity and accuracy.

To sum up, we may say that the present dirigibles, on account of the weaknesses noted above, are not of sufficient value in war to justify the expense of their construction and maintenance. The labor and money might better be spent upon aeroplanes and optical instruments.

In spite of the abundant means for observation and reconnaissance, these matters are neglected by the siege artillery. To compel commanding officers to attend to them, we should adopt a system of highly defiladed batteries and completely concealed targets, necessitating auxiliary observation stations; aeroplanes should be assigned to work with siege artillery; a plentiful supply of the best observation instruments should be issued; and special attention should be given to the training of patrols.

NOTE.—An appendix here follows, going more into detail on some of the points discussed above, giving data on the history of aeronautics, and describing some of the instruments mentioned in the text.

—Training and Maneuvers

Portugal

[Instruction of Artillery Units in the Land Defenses of Lisbon. By José Paulo Fernandes, Captain of Artillery. *Revista de Artilharia,* Jan 1915. 3500 words.]

Although regulations for exercises of *cadres* in the Portuguese army have existed in some form for about twenty years, there has never been any complete and satisfactory system for such exercises in the garrison artillery units of the Entrenched Camp of Lisbon. Some of the regulations have omitted mention of garrison artillery entirely; in the others, the treatment has been inadequate, especially for the troops of the Entrenched Camp.

The latest regulations, however, are so worded that only slight modifications and amplifications are required to make them cover all requirements of these troops. Notes should be incorporated in these regulations, providing for *cadre* exercises of both fortress and position artillery, to be held annually in each unit, under the supervision of the Inspector of Garrison Artillery. These exercises should be held on the positions to be actually used according to the general defense plan, and each should cover in detail the organization and defense of one such position.

The defensive lines of the Entrenched Camp are to the operations of a field army on the frontier, as the defensive lines on the Aisne were to the German offensive on the Marne. Thus the events of the present war, although as yet imperfectly known, point clearly to the importance of developing the efficiency of the garrison artillery to the utmost; and *cadre* exercises are so convenient and so important a means of instruction that they should be systematically and intelligently used.

[The Instruction of Artillery Units in the Land Defenses of Lisbon. By José Paulo Fernandes, Captain of Artillery. *Revista de Artilharia,* March, 1915, p. 449. 3800 words.]

The importance of temporary fortifications is becoming daily more clearly recognized. The Belgian fortresses have shown how easily the heaviest of permanent works may be reduced; the old saying, "a fortress besieged is a fortress taken," has been justified. The French fortresses still hold out, it is true; but they have never been attacked with the same determination as the Belgian, and by now they are strengthened by provisional works.

We ourselves have never had an adequate

defensive system for the capital; permanent works were out of the question, being too costly, and nothing else was considered sufficient. But the entrenched lines of both parties in the present war should furnish us a model for something which is not only cheaper and more practicable, but better. We already have general plans upon which to base such a defense; we have only to give our attention to instruction in accordance with them. Our lines as planned consist of a series of small entrenched camps, each with its points of support and centers of resistance, all mutually supporting.

It is urgent for us to procure the necessary artillery matériel; but meanwhile we can do much in the way of preparation. The strength of artillery lies in officers and men thoroughly skilled in the use of ground and in the conduct and application of fire; troops thus skilled can get good results out of unfamiliar or even inferior weapons, but the best of guns are of little service in the hands of untrained men.

Our defensive lines should be closely studied, and all plans of defense arranged. Accurate maps and panoramic drawings should be prepared, locating all points of importance, and showing the fields of fire from the various positions; all firing data should be ready; this material should all be easily available and officers and non-commissioned officers should be conversant with it. Thorough preparation for the use of new guns will be the best argument for getting the guns.

FRANCE

—Aeronautics

See

AERONAUTICS—FRANCE

AERONAUTICS—PROTECTION AGAINST AERONAUTIC ATTACK—FRANCE

—Army

See also

JOFFRE, GEN. JOSEPH JACQUES-CESAIRE

FOCH, GEN. FERDINAND

—Army—Artillery

[Glimpses of Military Life in France. (In an artillery regiment). By George Nestler Tricoche, late Lieut. French Artillery. *Jour. of the Military Service Institution, U. S.* Jan-Feb '15. 4000 words.]

The American soldier is better housed than his French comrade. The French barracks are either old discarded school and convent buildings, or, in a few of the so-called barracks constructed since 1871, they are built with little or no regard for comfort or sanitary arrangements. The greatest evil is lack of space. Not so very long ago part of the space in the dormitories was utilized for storage of foul smelling horse equipments, and, at the same time, meals were taken in the same rooms.

About fifteen years ago, however, the voice of the medical officers was heeded, and a decided improvement took place. But as soon as the Three Year Service Law was enacted the facilities for housing the troops did not increase with the increased strength, and the old conditions returned to a great extent.

Efforts have been made to place the latrines inside the buildings, but notwithstanding the great number of cases of bronchitis and pneumonia traceable to men having to go out from warm beds during the night, no improvement in this respect is noticeable.

The quality and quantity of food has improved, though it is far from satisfactory when compared with the three complete meals that an American soldier gets every day. In a battery nobody has constant and complete jurisdiction over the kitchen. The "commissary corporal" is a monthly detail. He attends mostly to the purchase, and pays no attention to the preparation of food.

Barracks and other military buildings are always surrounded by a high wall, and anyone desiring to see a soldier must be accompanied by an orderly or be stopped by the sergeant of the guard.

The number of drilling and working hours is greater than in the American service. Guard and fatigue are onerous duties.

Few cities in France have paid fire departments, and in such places, a garrison of soldiers must perform fire duty. Hence a "fire watch" has to be maintained.

The pay is so small as to be pitiful, and, notwithstanding a certain amount of comradeship between the private soldier and the non-commissioned officer, there is a wide chasm between him and the higher grades of enlisted men. There are certain small compensations in the way of reduced travel rates, etc., but nothing in the slightest to compare with the luxurious living of men of the American Army.

The artillery corporal does not belong to the grade of "non-commissioned officer," and he, therefore, remains with the privates, and, to an extent, his lot is very difficult. His duties and responsibilities are greater than those of the private, but the relationship is such as to make the discharge of these duties difficult.

The sergeant, while having practically the same duties as sergeants of the Army of the United States, is generally less trusted, and in this respect his position is inferior to that of the German or English non-commissioned officer. Regulations require that, in barracks, only two be placed in one room, but the crowding of the barracks has made this impossible of accomplishment. Due to discouragements of this kind, and to the low pay which does not enable a sergeant to provide many of the necessities not given by the government, the reenlistments among these non-commissioned officers is, in time of peace, falling off each year.

As for the officers, three-fourths of them are not contented with their lot, as pay is low and promotion slow. A great many coming from the technical schools retire as colonels, lieut.-colonels, or majors, while those coming from the ranks seldom rise above a captaincy. The French regulations forbid an officer to marry unless the combined income reaches a certain minimum limit, sufficient for support, but these regulations are frequently evaded. Compared with the financial situation of officers of the American service, French officers are in bad circumstances. Their families do not dwell on

FRANCE—Continued

military reservations, as in the United States, and the expenses, even comparatively, are great.

Each year there have been greater numbers of artillery officers, especially, resigning to take positions with technical enterprises. The graduates of the "Polytechnique" are in demand from such concerns.

There is nothing in the social life of an officer of a French artillery regiment that resembles that of the American officer. Except for a few more or less formal stilted functions, there is but little intercourse between the officers of the different grades, and garrison life is monotonous, so that they welcome the interval when field work and maneuvers take place.

See also

FIELD ARTILLERY—HEAVY—FRANCE

—Army—Cavalry

See

CAVALRY—FRANCE

—Army—Organization

[The Military Preparation of Young France. By George E. Pitt. *Fortnightly Review,* Nov., '15. 5000 words.]

(This article details the official steps taken by the French government to induce young men to volunteer for certain pre-regimental training devised particularly with a view to fit the young men for duty as non-commissioned officers shortly after they are called to the colors. For a certain standard of proficiency, a *brevet d'aptitude militaire* is issued, which leads to an appointment as a non-commissioned officer and in some cases to discharge into the reserve at the end of two years if they have then reached a certain standard of proficiency. Under the shortened service with the colors, and in the present war, this pre-regimental training has added importance.)

—Army—Sanitary Service

See also

EUROPEAN WAR—SANITARY SERVICE—FRANCE

HOSPITALS—IN EUROPEAN WAR—FRANCE

—Army—Service Regulations

[Service of Armies in the Field. Trans. from the French by Capt. W. A. Castle, Infantry, U. S. Army. *Jour. Military Service Inst., U. S.,* Mar-Apr, '15. 7000 words. May-June, '15. 8500 words.]

This is a decree of the President of the French Republic, of October 28, 1913, in connection with the decree of May 28, 1895, on the same subject. These two documents taken together establish field service regulations for the great units, which are: The Group of Armies, the Army, the Army Corps, and to a certain extent, the Cavalry Corps. The division, being the smallest and feeblest of organic units, comprising troops of all arms, is governed in conduct and mode of action by the field service regulations for smaller units.

The decree is divided into eleven chapters as follows: Chapter I, Generalities on the conduct of war; Chapter II, The Command; Chapter III, Liberty of Action—Security—Pursuit of Information—Exploration; Chapter IV, The Commander's Assistants—Instructions—Orders—Reports—Means of Communication; Chapter V, The Group of Armies; Chapter VI, The Army—Maneuver Formations; Chapter VII, The Army Corps—Marches and Halts—Security—Protection—The Combat—The Combat Plan—The Engagement—Combat Formation—Preparation of a Defensive Front—The Attacks of the Main Body; Chapter VIII, The Cavalry Corps; Chapter IX, Covering Troops and Strongholds; Chapter X, Corps of Observation; Chapter XI, Special Provisions.

—History

See also

NAPOLEONIC WARS

EUROPEAN WAR

—Military Vocabulary

See

VOCABULARY, MILITARY—FRANCE—ENGLISH TRANSLATION OF

—Navy

See also

EUROPEAN WAR—NAVAL OPERATIONS

—New War Medals

[French War Decoration. *Sphere,* May 22, '15. 200 words. Illus.]

The French Government has adopted a new war medal. The Official Journal gives the conditions of award and describes the medal. It is a cross of Florentine bronze, about 1½ inches across, with crossed swords in the center. In the center is also an effigy of the Republic wearing a Phyrgian cap and crowned with laurels, circumscribed with the words "Republique Francaise." The back of the medal bears the dates 1914-1915. The ribbon is watered green, with thin red piping and five red bands. Characteristic signs will distinguish the medals according to the title bestowed on the wearer.

FRONTAL ATTACK

See

TACTICS—FIELD SERVICE—FRONTAL ATTACK

FRONTIERS

—Defense of

See also

EUROPEAN WAR—SOUTHERN THEATER—NOTES ON

FURNACE, BLAST

See

BLAST FURNACE

FUSE

See

FUSE SETTER

SHRAPNEL—FUSE

FUSE SETTER

[The Fuse Setter Problem. By 1st. Lt. C. Parker, 6th F. A. *Field Artillery Jour.,* July-Sept., '15. 2500 words.]

The present fuse setter is inefficient and slow in operation, so that in the service of a 3-in. gun the fuse setting will always lag behind the laying when the gun squad is untrained. Several improvements have been suggested, but they have but little value.

The 3-in. gun should be developed on the line of the magazine rifle. The fuse setter is then applied to the magazine, the range elevating gear of the gun sets the fuse setter for range, and a separate mechanism sets off the corrector. The breech operating lever should be geared into the fuse setter in such a way that the first movements in closing the breech will set the fuse of the projectile. The second movement of the operating lever sets the loading device of the magazine in motion, while the third movement closes the breech completely. The recoil of the gun should open the breech and eject the cartridge case automatically. A vertical feed for the magazine is also necessary. The magazine is operated by the recoil and counter-recoil of the gun. This magazine fuse setter would increase the weight of the weapon, but it would be possible to reduce this by adopting differential recoil. A general description of the details of this proposed fuse setter is included in the article.

GASES, ASPHYXIATING

See

Asphyxiating gases

GERMANY

—Aeronautics

See

Aeronautics—Germany

—Aeronautics—Dirigibles

See

Dirigibles—Germany

—Army—Artillery

See

Field artillery—Germany

Field Artillery—Heavy—Germany

Machine guns—Use of in European war —Germany

—Army—Officers

[Personnel of Officers, Germany Army. By Colonel Juan Avilés, Spanish Engineers. *La Guerra Europea*, July 2, 1915. 1200 words.]

The German Army has been the best instrument of war that has trod the battlefields in the present struggle. This is no surprise to anyone except the British, who have persisted for years in depreciating the German organization and spirit. If there has been any surprise in other quarters, it has been because the German Army has proved better than the most optimistic had hoped.

All dispassionate and impartial persons that have come in contact with the German Army praise the bearing, culture and moral endowments of the officer personnel.

The personnel of officers in the German Army, as in any other, is the fundamental factor, the soul of the institution. With good officers, there are no poor soldiers, in the same way that, with a mediocre lot of officers, there cannot be an excellent army.

As there are all sorts of men in the ranks of the nation in arms, the officers have to know how to command and have to be superior to their men in rectitude, in equanimity, in valor, in justice, in foresight, in charity; in a word, must be worthy of their responsibility.

The love of country fuses all sentiments into a common aspiration, but is not sufficient to extinguish the personality of each individual. The prestige of command in itself is not appreciated to its full extent except by professional soldiers. It is something mysterious, inexplicable and subtle, yet real and tangible, an evident demonstration that, in man, mind is superior to matter. But, in the soldier who serves 2 or 3 years in the ranks and then abandons them to return only in time of national peril, it is not possible that the cult of obedience and voluntary discipline should form this sort of second religion. In the German Army, the patent superiority of the officer commands the respect of the men and assures him the cooperation of the ignorant and the intelligent.

The essential thing in the officer is personal worth and the union of those qualities which must be possessed by persons on whose inspiration and will depend the lives of many men. A personnel like this is not to be improvised; it has to be the fruit of the efforts and cooperation of the whole nation. If one organ is lacking, the system will break.

Compulsory service is the first step in order to obtain a superior personnel, because the instrument cannot be well handled without practice. Finally, the superior must be preoccupied, more than with the training of his soldiers, with the forming of the soul and of the heart of his young officers.

This is the great merit of Germany in matters military: the German officer is the essence of the German soul. This same officer transplanted to another country would perhaps not give good results. The secret consists in moulding him entirely to conform to the nation itself.

—Army—Sanitary Service

See

Sanitary Service—Germany

—Army—Uniform

See

Uniform—Field—Germany

—Food and Commodity Prices and Supply

See

European war—Food and commodity prices and supply—Germany

—History

See also

European war

—Military Conditions

See also

Kiel canal

—Military Rewards and Decorations

[Current Notes on the War. Editorial. *Artill. Monatshefte*, June, '15. 4500 words (total).]

Major-General Ziethen, formerly commandant of the School of Fire, Foot Artillery, is the first German artillery officer to be decorated with the order *Pour le Mérite*. He is now on Field-Marshal von Mackensen's staff.

—Munitions

See

Munitions—Germany

—Navy

See also article "British Sea Power; a comparative study" *under* Great Britain—Navy

GOERZ RANGE FINDER

[Goerz Artillery Range Finder, E 115, 1-meter base. Editorial. *Field Artillery Jour.*, Jan-Mar, '15. 3500 words.]

The requirements for the Goerz Range Finder are: easy manipulation, rapidity in location of target and measuring range, ability to measure varying distance on moving targets, insensibility to mechanical and thermal influences, sufficient accuracy, and facility in correcting instrumental errors.

The component parts are: range finder proper, tripod, adjusting bar, accessories and storage box. The range finder proper belongs to the *invert system,* has two objectives and an eye piece; magnifying power 15; field view 2° 40′; distances measurable, minimum 600 m., average error 1.2 m., maximum 8000 m., average error 207 m., tolerances in both cases are three times as great; weight of range finder and tripod, 33 lbs.; total weight with accessories, adjusting bar and storage box, 100 lbs. The range finder is quickly assembled on or dismounted from the tripod by means of a locking lever. An amber screen is provided for use in harsh light or a heavy haze. The diopter scale of the eye piece is then set to suit the eye of the observer. By means of the peep sight finder the instrument is roughly laid so as to bring the target within the field of view. Lateral setting is accomplished by turning the instrument on the tripod after which the locking lever is tightened. The field of view is divided into two parts, in the lower the image appears upright and in the upper inverted. By turning the measuring screw the images are shifted laterally until similar points are superimposed. The range scale is then read directly. For targets that have no prominent vertical lines or points but show horizontal details such as intrenchments, crests, etc., the range is taken to this horizontal line by turning the instrument in a vertical position.

In making corrections for height the instrument is sighted upon a prominent object and the proper adjustment quickly made by an adjusting screw. In making corrections for distance, the setting of the instrument for the distance infinity is examined. To replace an object at this distance the adjusting bar is used at a distance not less than 100 m. To insure accuracy, several readings should be made and the average of the corrections taken. The solid construction of the instrument makes it strong enough to withstand the usual field service if ordinary precautions are taken.

GONIOMETER

—Use of

[The Bennati Siege Goniometer; its trigonometric and topographic uses in the preparation of fire. By Capt. Giuseppe Gianni, Artillery. *Rivista di Artiglieria e Genio,* Mar, '15. 7500 words. 5 tables.]

The instructions for the use of this instrument discuss it only in direct connection with gun-laying. Siege batteries in position, however, are required to prepare large scale maps of their fields of fire, ruled in squares. These are not always easy to get; and this instrument is particularly well adapted to the work of preparing them.

Triangulation.

All recognized methods of locating a point on the ground depend upon the solution of triangles; their accuracy depends upon that of the measurement of angles.

The error to be expected in determining a distance is readily computed, as a function of the length of base, the accuracy of angular measurements, and the form of the triangle. The first problem here to be solved by the use of the resulting equations is to determine a maximum distance D, for which the range error produced by an error e in angular measurement will not exceed a fixed amount. This problem is similar to that of determining the useful limit of a range-finder; only the permissible error, instead of depending upon the accuracy of the guns, depends upon the scale of the map required.

By making all the triangles isosceles or nearly so, the equations may be reduced to a form independent of the actual values of the angles, and involving as variables only the length L of the base, the error e in angular measurement, and the permissible range error dD. The final form is:

$$D = \left[\frac{e^2L^2 + \sqrt{e^4L^4 + 16e^3L^2(dD)^2}}{8e^2}\right]^{1/2}$$

The instrument under consideration is graduated in mils, and may be read with fair approximation to a third of a division. This being the accuracy for each angular direction, the accuracy for each angle, or e, becomes $0.333\sqrt{2}$, or about 0.5 mil. Assuming $L=3000$ m., we have by the above equation:

for $dD=5$ *m.* (*1-25000 map*), $D=4020.8$ *m.*
$=10$ *m.* (*1-50000 map,*) $D=5580.9$ *m.*

With a more accurate instrument, giving $c=0.05$, the results become respectively 12,293.5 and 17,353 m.

If distances thus determined are to be used as bases for further triangulation, the permissible error could not be more than 1 m. The maximum range for this is 2080.6 m. If it is desired merely to determine ranges for gun fire, the permissible error is say 100 m.; if ranges up to 10,000 m. are desired, the same equation gives the requisite base as 998.8 m.

It is evident, then, that the instrument in question may be made very useful in these measurements.

Stadia Measurements.

The instrument has a reticule graduated in mils, horizontally and vertically; by means of these scales, stadia measurements may be readily made. Computations as to accuracy, made on the same principles as before, give us tables of distances and permissible errors, enabling us to decide whether the instrument is suitable for a given use. It may at times be found more convenient to make measurements of this kind, not by reading the reticule scales, but by directing the zero successively upon the two ends of an object of known length, and reading the micrometer scale. If the ground is not level, a table giving the necessary corrections may readily be prepared, for use in connection with the vertical scale

on the reticule or with the angle of site scale.

These measurements with the instrument in question are all more than sufficiently accurate for topographical work of this kind. Siege batteries in position can easily establish, by mutual assistance, all necessary primary and secondary triangulation stations.

Measurements of Altitudes.

By use of the angle of site scale, the difference in level between any two plotted points may readily be determined. Here again calculation shows sufficient accuracy for distances not over 1000 m., even if readings are taken only to the nearest mil.; or for 3000 m., if they are taken to the nearest third.

In these calculations, refraction and the curvature of the earth have been neglected. The corrections may easily be calculated if desired.

Measurement of Base Lines.

A fairly accurate method of measuring a base line is to lay off equal lengths on perpendiculars at its extremities, and from a point on the line measure the angles subtended by these. Applying the same general method as before, the permissible error is found to be very small—0.03 mil for a base of 500 m. and perpendiculars of 50 m. This indicates that the instrument in question is not suitable for this purpose.

Tables—I.—Transformation mils to degrees. II.—Transformation degrees to mils. III.—Reduction of inclined stadia measurements to horizontal. IV.—Corrections for sphericity and refraction. V.—Altitudes.

GREAT BRITAIN

—Aeronautics

See also

AERONAUTICS—GREAT BRITAIN
DIRIGIBLES—DIRIGIBLE DESTROYERS—GREAT BRITAIN

—Ammunition

See

EUROPEAN WAR—AMMUNITION—SUPPLY—GREAT BRITAIN

—Army

[Some Thoughts on England's New Military Power. By "Rooinek." *United Service Mag.* Apr '15. 2800 words.]

Since the beginning of the present war England has become a great military power by raising, training, and equipping a vast volunteer army. The larger part of this force is being sent overseas to fight, involving great difficulties of transportation. The number left behind for Home Defence will necessarily be nearly equal to the force sent to the continent, so that the total will be close to two million, with prophesies of even greater numbers. When this undertaking is completed, England will be an important military Power, even compared to the great armed nations of Europe.

"The influence on the world-power of England that the existence of a great army available for service in any portion of the Empire must have in the present and the immediate future * * * both as regards her internal and external welfare" is to be considered. Military strength is not counted in numbers, but it is the power to be strong at the strategical point. With her new land forces England's supremacy on the seas gives her this power.

After the war there will hardly be a reversion to the old order of things military. The influence of the war on the race will be lasting. Men of all castes and classes will have fought side by side. The popular prejudice against the profession of arms will have largely, if not completely, broken down. The colonies, too, will be more closely knit to the Mother Country through a common cause and by her example.

Assuming a victorious war, large numbers of men will be thrown back into the pursuits of civil life at its end. Can England immediately divest herself of her armies? "She must remain strong until the fruits of victory have been guaranteed." Her total fcrce cannot be kept on a war footing; but a *via media* is practicable, such for instance "if the cadres for all the units were kept up * * * then each division would have a nucleus around which to build on mobilization, and the armies could be re-created and be ready for war within a very short space of time."

Munitions and materials of war have been even more lacking than instructors for the citizen-soldiery in the present crisis. Some future system of subsidizing, during peace, firms for the supply of such necessities must be devised. England must have, "to sum up, such an organization of her resources that they can be brought to bear at any moment in any direction."

This would be a temporary military plan for, say, a decade "during which international affairs would have time to resettle themselves, and during which we should have opportunity of working out a scheme for defence * * * on a more permanent basis."

See also

EUROPEAN WAR—FORCES ENGAGED—GREAT BRITAIN

—Army—Artillery

See also

FIELD ARTILLERY—HEAVY—GREAT BRITAIN
FIELD ARTILLERY—MATERIEL—GREAT BRITAIN
MACHINE GUNS — ORGANIZATION — GREAT BRITAIN

—Army—Organization

[The New English Armies. By Capt. Ruge. *Norsk Militaert Tidsskrift,* Mar. and Apr., '15. 8000 words.]

England furnishes many examples of the tremendous difficulties of nations without adequate defense when plunged into unavoidable war. Yet England did not enter this war entirely unprepared. Experiences gained in the Boer war had pointed out a way to meet the situation. The method by which the country was to meet its obligations on shore in case of war had been discussed for several years, and, although these discussions had led to no practical action, they had made clear the extent of the problems and the means for solving the same.

Particularly had the Boer war given the officers, who now filled the higher grades in

GREAT BRITAIN—Continued

the army, a clear understanding of the question of defense of the country, and the peculiarities of untrained troops and the kind of work one might expect from them. The army of 1914 was founded on the experience gained in the Boer war. At the outbreak of that war, England could only furnish an expeditionary force of 84,000 regular troops by using all reserves (discharged soldiers). Back of this they had the militia, consisting of 100,000 poorly trained men; the yeomanry, 10,000 men, and the volunteers, 230,000. These organizations had no higher units than the battalion, and were never united with regular troops for field training.

After the first defeats had convinced England that the expeditionary force of regular troops was altogether too small to finish the war alone, the voluntary organizations were called upon, and the majority obeyed the call. Their participation in the war brought them no laurels. Their principal faults were extreme youth of the soldiers, lack of trained officers, and lack of target practice.

The yeomanry and volunteers were recognized as being so worthless that no attempt was made to send them to the front as organizations. They became recruiting sources for new field organizations. In this way the "Imperial Yeomanry" was recruited. These new organizations received 2 to 3 months' training in the homeland before they were sent to South Africa, where they received an additional 2 months' training before they were trusted at the front. All the battalion commanders were regular officers, and the men soon developed into dependable troops. The second contingent of yeomanry was sent to South Africa without training to meet urgent demands, and the general opinion was that these were utterly worthless. After several months' training in South Africa, and after a large number of officers and men had been weeded out, Lord Kitchener finally used them as *étape* troops.

A different method was used with the volunteers. These also were recruited from existing volunteer organizations, the age limits being between 20 and 35 years. The force was organized into companies under volunteer officers. These companies were sent at once to South Africa, where they were attached to the regular battalions as a 9th company, and remained with their battalions throughout the war. These companies did very well and were constantly used for work which required particular alertness and special handicraft. Only "The City of London Imperial Volunteers" were used as a larger unit. It consisted of 1 battery field artillery, 2 companies mounted infantry and 1 battalion. The commanding officer, his staff and all administrative officers were taken from the regular army. Lord Roberts referred to them as "an exceptionally useful force, which acquitted itself splendidly."

On the whole, however, these hastily recruited forces appear to have been very slender reeds to lean upon.

The lessons learned by the English from the Boer war may be summed up as follows:

1. The regular army was too small to protect the interests of the country during extended conflicts. It therefore had to be augmented by other forces, which could relieve the regular troops outside eventual theatres of war, and, if necessary, directly support the field armies. 2. The existing voluntary troops were useless in the field. In general, untrained troops, composed of all kinds of people, were of little value in the field before they had been mobilized and trained for 6 months.

The Chief of Staff of the English South African forces said: "Only after a militia battalion has been mobilized and trained for 6 months or more can it handle itself after a fashion." 3. The foregoing remarks pertain to ordinary untrained troops, and not to organizations recruited from specially qualified classes such as men of a higher education, sportsmen and men used to an active outdoor life under conditions which make them self reliant. From these classes very useful troops can be formed, especially if built around small cadres of regular troops.

Apropos of the colonial contingent General Ian Hamilton said: "Experience taught that when led by trained officers and non-commissioned officers, even practically untrained troops were quickly turned into useful troops." Lord Roberts mentioned that "it was noticeable how the value of the colonial troops was increased when led by officers detailed from the regular army." About volunteers he said: "It was marvelous how they improved when attached to a regular battalion. In the course of a few days they were excellent." 4. Local patriotism and class feeling are normal factors of high value and should be utilized in organizing volunteer troops. 5. Lack of a sufficient number of trained officers is the hardest problem of all to solve when it is necessary to expand and mobilize the army quickly.

Lord Kitchener said: "The officer is the only one who cannot be improvised."

The experiences gained in the Boer war led to the so-called "Haldane's Army Reform" of 1907, based on the following principles:

1. Certain changes in organization, etc., without increase of the regular army, which would leave the greater portion of the regular troops available for service wherever and whenever necessary.

2. To replace the older voluntary organizations with a single volunteer force which could undertake the defense of the British Islands without aid from the regular army, and which during a long war might be used outside of the homeland.

3. To create a sufficient reserve of trained officers.

To further the scheme an expeditionary force was organized consisting of the following regular troops: 6 infantry divisions, 1 cavalry division and 2 mounted brigades. These were kept at full strength in peace, and so quartered that they could constantly maneuver by brigade and division. An attempt was made to create an available reserve by shortening the term of enlistment

and by forming the former militia into a "special reserve." For the defense of the homeland a "territorial army" of 14 infantry divisions and 14 mounted brigades, in all 214 battalions, 168 squadrons, 186 batteries and 58 companies of engineers, besides fortress artillery and non-combatants, was formed. The privates were enlisted for 4 years and drilled on Saturday afternoons. A small cadre from the regular troops furnished higher commanders, staff officers and instructors for each battalion. This force was never fully recruited. Attendance at drills, though theoretically compulsory, was never enforced, as the men received no pav.

Officers were drawn from retired regular officers, the special reserve, universities and high schools. A year's training with troops, concluding with an examination, was required in order to qualify as officers of the territorial army. Students were to serve from 4-8 months after passing through the "Officers' Training Corps."

At the outbreak of war England had about 268,000 men in the "Expeditionary Force," besides the "Territorials," supposed to number 315,000 officers and men, but which were short 130,000 of their full strength. The territorials were first used to relieve regular troops at Gibraltar, Malta, Egypt and India. In this way the expeditionary force in France was augmented by 2 new regular divisions (the 7th and 8th). More troops thus relieved furnished cadres for the subsequent "mixed divisions" (regulars and volunteers). Territorials also relieved colonial troops, permitting these contingents to be used in France, China, East Africa and Egypt against the enemy.

Territorials and colonials form part of the present British force in the Gallipoli Peninsula. But England was woefully weak in France and to give force to their campaign there Parliament went to work. "Parliament authorized Aug 6th an additional 500,000 men, on Sept 10th 500,000 men, on Nov 16th 1,000,000 men, thus authorizing the government to maintain under arms 2,500,000 in addition to the 'Indian Army' and colonial troops."

Within these liberal limits Lord Kitchener could organize his "new armies."

New divisions were organized in groups of six on the following dates: Sept 11th, Sept 13th and Sept 14th, a total of 230 battalions, 160 batteries and 54 companies of engineers.

On Sept 21st, orders were issued that territorial troops sent to foreign countries or the colonies should at once be replaced by identical organizations at home. This doubled the territorial army. Later orders were issued practically trebling this category. The British Isles and the colonies were combed for material for officers for these troops. Lord Kitchener refused to permit these troops at the front with less than 6 months' prior training.

This no doubt led the impulsive Chamberlain to send his equally untrained marines to Antwerp, only to have the majority interned in Holland after the fall of the city.

In February the first six divisions were ready for the field and the other twelve divisions qualified in March. The army's division into 6 field armies of 3 army corps each indicates that all or the greater part of the new troops are, or soon will be, on the continent.

In breaking in the new troops, General French has proceeded in a most sysematic manner. The companies of the territorial battalions, for example, were assigned among the regular battalions, and under their tuition took their regular turn in the trenches. Not until so coached were they trusted to themselves in the general line, and were then further steadied by placing them between battalions of regulars; which was only applying the experiences gained in the Boer war.

It will be intresting to see how these new divisions will conduct themselves in front of the enemy. The "mixed divisions" should do well, while too much should not be expected from the 18 new divisions.

—Army—Sanitary Service

See also

EUROPEAN WAR—SANITARY SERVICE IN—GREAT BRITAIN

—Compulsory Military Service

See

GREAT BRITAIN—MILITARY POLICY OF

—History

[Anglo-French Relations. Historical serial by Maj.-Gen. T. F. Lloyd. *United Service Mag.* Apr '15. 2400 words.]

See also

EUROPEAN WAR

—Military Policy of

[Only Road to Victory. *Weekly Edition London Times,* June 4, '15. 250 words.]

More and more evidence accumulates in favor of compulsory service as the only remedy which goes to the root of present difficulties—unfair methods of recruiting, the drain on the pick of the nation, the now admitted deficiency in munitions and the men to make them, labor disputes, and a distressing sense of importance when the organized strength of every man and woman is needed.

["National Service." By military correspondent. *Weekly Edition London Times,* June 4, '15. 1100 words.]

The problem of recruiting is becoming too big to makc it wise or practicable to continue to rely much longer upon voluntary service. The military forces at the front and the useful distribution of labor at home require that the Government be armed with full control over the services of every able-bodied citizen. It is indispensable that there should be a steady flow of men at fixed dates to maintain the large forces in the field. The first step is registration, and the military authorities must ascertain the strength needed for victory in different theaters, duly considering the labor needs of the country.

With a standard of strength determined, the Minister of Munitions will have a definite problem to solve, and can make sure that

GREAT BRITAIN—Continued

every description of munitions will be ready for each division when that division is ready to receive them. Strikers who throw down their tools must be treated as harshly as soldiers who desert in the field. If the principle of obligatory service is to be applied, a whole train of secondary measures results. The men must be called in the order of their availability, first the younger unmarried men and through various classes to the older married men, with careful attention to exemptions. All distinctions of Regulars, Special Reserves, Territorials, and New Armies must be broken down. The Government requires power to send men where needed.

Anticipation of the possibility of compulsory service is affecting enlistment, many enlisting for home defense alone in the belief that they will thus escape service abroad if compulsion comes. It should be made clear that this is not the case. The best home defense is in Flanders, and there is no reason why the citizen should be allowed to choose how and where he shall serve the state. That stage has been passed. For the term of the war, old customs, habits and prejudices must be held in abeyance. The whole strength of the nation must be brought to bear, and the country awaits a call from competent authority to respond with enthusiasm.

[The Armed Nation. By H. M. Hyndman. *Fortnightly Review,* Sept. '15. 5000 words.]

I. Voluntary Army and Conscription.

The difficulty if not danger of compulsory military service is obvious to all. On the one hand it is declared that voluntary recruiting would suffice for British needs. On the other, the butcher's bill of the war is already so great, that a much more drastic system of obtaining the needed men is under discussion. But full proof of this will be demanded by the people at large; voluntary recruiting has so far provided more men than government can clothe, arm and equip. The British are now forced by policy, as well as by the pressure of their Allies, to conduct the war on land upon the continental scale, besides maintaining the command of the seas. For this, so it is said, only compulsory service will provide, for voluntary enlistment will furnish enough men neither to arrest the German invasion, nor to assure a triumphant issue to the war. If this be true, volunteering is self condemned. There are other drawbacks to the system as well: the unselfish come forward, the selfish stay behind. Moreover, the voluntary army, regulars and territorials, is a class army—hence apart from the present national stress, what is needed is neither the perpetuation of the present system nor conscription. Conscription is unpopular even in Germany and in France; in saying this, it is admitted at the same time that in the former country, compulsory service has developed the male animal physically, has helped to develop the force of the nation and of its people.

II. The Democratic Citizen Army.

If then, voluntary enlistment has failed, and conscription is objectionable, the solution is to "establish a thoroughly efficient national army in which all males are obliged to serve from their youth upwards, yet in which there exists no class supremacy, military law is unnecessary, and every soldier enjoys, except during active warfare, his full civilian rights. Only under such conditions can the population of Great Britain be induced to accept such an interference with their personal liberty as the obligation imposed upon every active man to place himself under military discipline and fight for his country if called upon."

Continental Socialists have voted unanimously at their International Congresses in favor of a "democratic national citizen army." An army thus recruited and organized for national defense would be entirely free from any militarist fervor. In constant contact with civil life, it would be too greatly interested in avoiding war to indulge in any haphazard ventures. At the same time, "to be unprepared is to court war, when the Powers are ready to carry out a hostile policy; whereas to be ready for defensive war is the best chance of ensuring peace." Untrained or half-trained troops when opposed by thorough soldiers, should be regarded with mistrust. "Patriotism, enthusiasm, self-sacrifice, courage and devotion will not make up for the absence of knowledge, experience and physical training for service in war."

Switzerland furnishes the best model for the reorganization of our [British] army during the war and afterwards in peace. In this country defense training begins in the schools. From boyhood on through youth to manhood, the Swiss grow into good soldiers as they learn to become good citizens. This Swiss system could not be applied all at once, but some modification of it is imperative, if we are to defend these shores and keep our treaty pledges. And as regards the future, the first condition of a powerful citizen democratic army is the provision of educated democrats and physically capable citizens, and this implies a reformation of the terrible social conditions that exist in England.

—Munitions

See
MUNITIONS—GREAT BRITAIN

—Navy

[British Sea Power. A Comparative Study. By A. M. Reith, Joint Hon. Secy. Navy League, Bombay Branch. *Jour. United Service Inst., India,* Apr., '15. 6000 words.]

With Trafalgar, Britain was freed from the danger of invasion. Ever since that victory, Britain has reigned supreme, and until the last decade, unchallenged mistress of the seas. Our sea power kept open our communications during the Crimean war, the Indian Mutiny, and the South African war. The progress of industrial relations has continued unchecked since then, and that very progress contains the germ that makes world wars not only probable but almost inevitable. Two reasons why wars must be regarded as almost a certainty, as almost a biological necessity, as

Bernhardi implies, are that the earth's surface is limited and that the different nations are engaged in a struggle for industrial survival. Our fleet not only protected us from invasion, but enabled us to acquire most of the vacant land of the temperate zones. Progress soon turns consumer into producer and strong, fit, efficient and hungry nations cannot be expected forever to remain idly watching their rich rivals enjoy the good things the latter are not strong enough to defend. This economic rivalry, this struggle of nations for work and food grows daily more intense. Nations may love peace, but they must live, and since trade is necessary to living, they must have trade even if they have to fight for it. This struggle made France and latterly Germany our commercial antagonists and, what is more important, our rivals in sea power.

As the British Parliament is the mother of all popular representative institutions, so the British Navy may be said to be the mother of all navies.

The British Admiralty had little part in upbuilding the German fleet, but British naval power fired the imagination of the Kaiser. The delays and confusion incident to the naval review held in 1889 at Cowes, at which the Kaiser was present, must have suggested to the young ruler, familiar with the standard of efficiency attained by the German Army, that something was lacking. The British Navy was living on its past achievements. Conditions of naval warfare had altered, but the British fleet remained faithful to the old regime. Just as the British Navy inspired German ambition, so German thoroughness in organization, applied to its growing fleet, reacted upon the British Navy and gave it new and vigorous life.

The Kaiser has constantly striven to increase the German Fleet, but his ambition was not satisfied in this regard until that master of organization, von Tirpitz, became Minister of Marine in 1897. Admirable politician and diplomatist that he was, von Tirpitz overcame all opposition in the Reichstag, which not only agreed to his first naval budget, but also to the bill, introduced in 1900, which practically doubled the German fleet.

Then came the Dreadnought in 1906, and German naval plans were amended so as to permit the construction of Dreadnoughts, leaving the Minister of Marine complete freedom as to design and tying his hands only as regards the number of keels to be laid down.

Then followed the great German naval act of 1912, creating and maintaining in full commission a third squadron of eight battleships and increasing the personnel by 15,000 officers and men.

In 1898, the total strength of the German fleet was 14 battleships (half of which were third class ships), 18 coast defense ships, 13 cruisers (9 of which were of low power), and 4 torpedo gunboats.

In 1914, before war broke out, its total strength was 43 battleships (20 of which were dreadnoughts), 15 large armored cruisers, 39 protected cruisers, 186 torpedo boats and destroyers, and 24 submarines, with a total personnel of close on 75,000 officers and men.

So in 16 years, Germany had not only immensely increased her fleet, but had forced other powers to organize and train their squadrons on a standard of efficiency never attained in the past.

Germany with her system of conscription could find the men, and that is where we with our voluntary system of enlistments have had trouble. Within 16 years, Germany has built and organized a fleet of five battle squadrons, two composed entirely of Dreadnoughts, and the third of good ships of the *Deutschland* class. Each German battle squadron is attended by a battle or armored cruiser squadron complete with small cruisers and auxiliaries of all kinds and accompanied by numerous flotillas of destroyers and submarines; more than three-fourths of the fleet, in fact nearly four-fifths, is maintained in full permanent commission—truly a most formidable fleet. The tremendous effort and sacrifice all this entailed will be better appreciated when it is remembered that such a fleet is not complete without docks that take more than four years to build, seamen that take three and officers seven years to train, and the large ships four years, small ships eighteen months to build. I cannot help thinking that the German Navy is practically the work of two men only—the Kaiser and von Tirpitz.

Our Navy must be the largest and most efficient. It is necessary to our very existence. Apathy on the part of the public has in the past almost brought our sea power to absolute ruin. The cost of upkeep of our Navy no doubt increases yearly, but at present does not exceed 2½ per cent. of the 20 million tons of annual British shipping, whereas the upkeep of the German fleet amounts to about 5 per cent. of the 4½ million tons of annual German shipping. Besides, Germany pays for a huge army.

We have tried to meet German naval competition by changing from our old time Two Power standard to practically a two keels to one standard in all classes of ships with the exception of Dreadnoughts or capital ships, where the standard is 60 per cent. greater than that of the next strongest naval power.

So to-day we have four battle squadrons, comprising 28 of our finest modern battleships with cruisers and destroyers and a battle cruiser squadron of four very fine ships with 13 armored cruisers, light cruisers and mine sweeping gunboats. This constitutes the First Fleet.

The Second Fleet consists of two battle squadrons of 15 pre-Dreadnought battleships with cruisers and a mine laying squadron of 7 ships. Then there is the Third Fleet of 14 battleships and about 30 cruisers. In addition, we have 10 torpedo flotillas and 7 submarine flotillas. Part of these are constantly patrolling the east coast of Britain between the coast of France and the Faroe Islands. The First and Second Fleets were in peace time constantly ready for war. The Third Fleet contained only experts and specialists of the ships.

GREAT BRITAIN—Continued

the balance of the crews were to be drafted on mobilization.

Then there is the Mediterranean Fleet of three battle cruisers, armored and other cruisers, destroyers and submarines, the East India squadron, China squadron, etc., etc.

The total strength of our fleet is about double that of the German Fleet, but our ships are scattered all over the world and Germany's strength lies mostly in the North Sea and in the Baltic.

On March 31st, 1914, the personnel of the British Navy consisted of 146,000 officers and men, 16,000 Marines, 26,000 men of the Fleet Reserve, some 28,000 men Royal Naval Reserves, Volunteer Reserves, and Australian Fleet, a grand total of some 220,000 officers and men.

Four great dangers confronted the British Navy on the outbreak of the war. That of being surprised before it was ready—the greatest peril of all; that of the escape of large numbers of enemy ships into the trade routes; that from mines; and that from submarines.

The whole energy of the fleet is to-day devoted to fighting against these four dangers. We owe it to the German menace that of recent years we have been forced to have a big navy, that probably never before in our history have naval strategy, tactics and war efficiency been studied as they are studied at present in our navy.

As to the future, everything depends upon the German Fleet. So long as it remains intact, so long does the menace to our sea power remain.

The enemy's fleets are bottled up, his commerce swept from the seas, his offensive action strictly limited, and we control all trade routes. We are in the magnificent position of holding the unchallenged supremacy of the seas and should disaster, great or small come, we are not going to lose that supremacy. I would ask you all to put your trust in our great silent Navy, and I can assure you that such trust will not be reposed in vain.

See also

BATTLESHIPS—COMPARATIVE POWER OF
EUROPEAN WAR—NAVAL OPERATIONS
SUBMARINES — DEFENSE AGAINST — GREAT BRITAIN

—Navy—Submarines

See

SUBMARINES—USE OF IN EUROPEAN WAR

GRENADES

[Hand Grenades. By E. C. Crossman. *Scien. Amer.*, May 8, '15. 1500 words. Illus.]

The trench warfare in Europe has again brought the hand grenade and bomb-throwing weapons in general into a prominence that modern weapons had seemed to preclude.

The British hand-grenade consists of a cane handle 16 in. long with a 3-ft. piece of cloth to act as a tail. The head contains the bursting charge. The detonator is carried separatelv and has a safety pin. It is prepared for use by removing the safety cap from the grenade, and the safety pin from the detonator and by attaching the latter, when the grenade is ready for use. It may be thrown either over- or under-handed.

[*Information*, June '15.]

The hand-grenade has been revived and is used to a considerable extent by the French in trench fighting. In another form, the "rifle-grenade," they are used at a longer range. According to *The Technical World Magazine* (Apr), the revival of these ancient weapons was due to Col. Amazawa, of the Japanesse army, who experimented with them during the siege of Port Arthur. The Spaniards then tested the weapons with great success. Each rifle-grenade is a stout brass tube, 5½ inches long by 1⅜ inches in diameter, and weighing 23 ounces when charged. The charge of high explosive is about one-third of a pound. Each grenade is provided at one end with an iron rod which fits into the muzzle of a rifle. When fired, the missile will travel two hundred and fifty yards. If desired, however, the rod may be replaced in a moment with a sort of rope-tail, for grasping with the hand, enabling the holder to throw it a distance of forty or fifty yards. These rifle-grenades are more commonly used for greater distances—particularly in cases where the enemy is approaching the barbed wire entanglements or other barriers that defend a more or less permanently occupied position. Cross-bows are also used to cast grenades. Already we have various kinds of grenades, such as "incendiary" grenades, "illuminating" grenades, to give light for a night attack; "drop" grenades, for use from aeroplanes; and "giant" grenades, of two hundred pounds weight, to be fired from a small mortar. The popularity of the grenade is weakened by the fact that they are often dangerous, if not fatal, to the thrower.

See also

ASPHYXIATING GASES—HAND GRENADES FOR

—Use of—Grenadiers

[Note. *Army & Navy Jour.*, Nov. 13, '15. 100 words.]

Grenadier, long a name only, has come again to mean something. A certain number of men in each battalion of the British army are now designated as grenadiers. The *London Times* gives the number as one officer, two sergeants and eight men per battalion, in addition to one n. c. o. and eight men per platoon. In the cavalry and yeomanry regiments one n. c. o. and four men per troop are trained as grenadiers. The grenadiers wear a distinguishing badge on the right sleeve.

—Use of in Russo-Japanese War

[Hand Grenades in the Russo-Japanese War. *Professional Memoirs*, July-Aug '15. Tr. from the *Voenni Sbornik*, Jan 10, 2000 words.]

The Russo-Japanese war saw the reintroduction and effective use of a well-nigh forgotten weapon. In trench fighting, in attacks on casemated buildings, and generally in all hand-to-hand fighting, the hand-grenade

proved a valuable and essential weapon. With the development of field fortification, and the resultant close combat, every contrivance of military engineering is resorted to; and the hand-grenade will prove indispensable in both fortress and field warfare.

Dating from the 15th century, the hand-grenade was popular in the 17th century, but little used after the 18th. First employed at Port Arthur in Aug., '04, it became at once the principal weapon at close quarters. The first grenades were improvised from the cases of artillery shells, cut down to a 4-inch length, filled with dynamite or gun-cotton, and fitted with ordinary Bickford fuse, burning 15 seconds. If cut too long, these fuses resulted in the grenades being promptly thrown back.

To extend the sphere of the grenade, wooden mortar tubes were introduced of 5-inch caliber and of constant elevation 45°, which threw bombs over a range of from 50 to 230 yards.

Various high explosives were used in the grenades, one powerful Japanese type consisting of a prism of picric acid between two cakes of gun-cotton. While the ordinary grenade weighed from 1 to 2 pounds, another type, with thick envelope, weighed from 3 to 4 pounds. The original Bickford fuse arrangement was unsatisfactory, and was gradually replaced by a percussion device, with a fulminate primer, and some means of insuring vertical impact, much as a leaden ring round one end of the cylinder. This percussion type of grenade could be thrown by the handle up to a distance of 60 paces.

Grenades have a two-fold effect: that due to the bursting splinters, and that caused by the liberated gases. In addition, the explosion has a marked moral effect on the troops exposed to it. The radius of action of the ordinary grenade is 20 to 30 paces. The effect of the grenade is described as being very powerful, as many as twenty casualties being ascribed to one burst.

Instances are given of the effective use of grenades by the Japanese in preparing the way for assaults, by the Russians in defending ditches and forts. The men had great faith in them. The soldier, in assaulting. usually carried his rifle in his left hand and sometimes dropped it to have both hands free for throwing. In August the Russians at Port Arthur manufactured 18,000 grenades.

Hand grenades can be used advantageously:

1. To prepare for an assault, in crossing the last 60 to 100 paces.
2. In hand-to-hand fighting.
3. To facilitate and cover the destruction of obstacles.
4. To drive the defenders from permanent fortifications.
5. In the defense of fortified positions against assault.
6. In defense against sapping.
7. For reconnoitering patrols and outpost lines.
8. For cavalry.

Troops should therefore be carefully trained in the use of grenades in time of peace.

GRENADIERS

See

GRENADES—USE OF—GRENADIERS

GUERILLA WARFARE

See also

NATIVE UPRISINGS—MILITARY HANDLING OF

GYMNASTICS, MILITARY

[Gymnastics and Fencing in the Army. By Lt. Robert O. Proschle, Chilean Army. *Memorial del Estado Mayor de Chile,* Apr., '15. 7500 words.]

Gymnastics now form a recognized part of the system of education for all the faculties of the human body, and of necessity must be employed in the instruction of the soldier.

The instructor must not content himself with following literally the provisions of the gymnastic manuals, but must study the pleasure and taste of the student.

In the Chilean service the importance of gymnastic instruction and fencing is not well understood, probably due to long years of neglect on the part of superior authority.

In instruction the interest of the men is kept at a high point only by keen work on the part of the instructor. He must stimulate by example, and not by mere perfunctory orders. Hence it is incumbent on all the junior officers who may serve as instructors to know how to execute all of the exercises themselves; in other words, to serve as a model.

Intermittent instruction must be avoided. The muscles become inelastic and inflexible after a period of inactivity, and the work must then be commenced *ab initio.*

For fencing, as for gymnastics, the instructor must be the model. His ability to instruct and to carry weight in his instruction is measured by his personal ability in the use of the weapon.

In the allotment of time for these exercises, in general it will not be possible to give the work more attention than is now given, but it is certainly possible to use the time to better advantage.

On beginning the instruction, the exercises should be executed slowly and carefully, and rapidity gained only with facility of execution. The essential parts of each movement must be explained beforehand, and corrections made in detail, insisting more on agility than on brute force. Long and tiresome explanations are to be avoided.

There follows a program of instruction in gymnastics and fencing for a period of 24 weeks, including calisthenics, exercises with apparatus, field exercises, and exercises with rifles, together with a complete course of instruction in fencing with bayonet and foil; and a critical analysis of some of the radical errors.

HANGARS

[Texas Aero Sheds for Signal Corps. *Aeronautics,* July 30, '15. 300 words.]

Bids were opened in the office of the Chief Signal Officer on June 20 for the aeroplane sheds for the proposed aviation school at Fort

HANGARS—Continued

Sam Houston. The two sheds will each house five aeroplanes and will cost about $20,000. They will be constructed of corrugated iron, on structural steel frames. A novel feature is the door arrangement. By means of a curved overhead track and pivoted door hangers, the doors may be slid around the curve to a position along the side of each compartment. The construction of the sheds will be finished about Dec. 15. The First Aero Squadron will then go there for station.

HARNESS

—Field Artillery

[The Artillery Collar. By 1st Lieut. H. Pfeil, 1st F. A. *Field Artillery Jour.* Jan-Mar, 1915. 1200 words.)

The French harness is so simple that the drivers can easily adjust the breast collar. It is impossible to do this with our steel collar, which will produce galls when adjustment is not carefully made. In war men will neglect their horses; the latter will lose weight around the neck and shoulder and steel collars will soon gall and horses become useless. We should adopt a collar which will always give a fair efficiency under all conditions of service. even when used by inexperienced men. Equipment must be simple and fool proof. In time of war a motley class of horses will be dumped upon the artillery for draft purposes, and even experts will not be able to fit them with our steel collar. Also losses will be great and remounting will be frequent. A substitute for the steel collar such as the breast strap or Dutch collar, or the humane collar should be adopted. The humane collar has an advantage over the breast strap, but both are easily adjusted and are nearly fool proof.

[The Substitution of the Breast Collar for the Present Steel Artillery Collar. By 1st Lieut. F. W. Honeycutt, 3rd F. A. *Field Artillery Jour.* Jan-Mar 1915. 1500 words.]

Present steel artillery collar was adapted from the Kansas City Fire Department. All our experiences with it are based upon peace service. When properly adjusted, it is the best form of traction. Adjustment is difficult, and because of probable use by volunteer and militia batteries and exactions of field service, a substitute should be found which is simple and easily adjusted. This substitute is found in the breast collar. On Oct 4, near Compiègne, the horses of a French battery equipped with breast collars were seen. Had been in harness four days; no sores but the skin was worn callous.

When driving artillery teams remember the following DONT's: Don't whip when horse is pulling his heart out; don't teach your horses to fail; don't think it a disgrace to have cannoneers help a team by use of drag ropes; give the horses a breathing spell in or after a hard pull; have the drivers be quiet and calm in a hard pull; don't whip, whoop or curse; never take a difficult pull "with a rush"; don't hit a horse because he is thirsty and trying to drink out of the same bucket with his mate; don't fail to dismount the drivers frequently; don't try to regulate the gait of draft horses by that of a single nervous horse.

HARRIMAN HYDROAEROPLANE

[The Harriman Hydroaeroplane. *Army & Navy Jour.*, June 5, '15. 250 words.]

Tests of this hydroaeroplane are being watched with interest. It is entirely an American product. The Harriman motor appeared in 1909. Until that time practically all of the engines in high grade aeroplanes and hydroaeroplanes were manufactured abroad. None of the other machines with domestic engines have been able to meet the requirements of the War Department. The European War has shown the danger of depending on foreign engines. The Harriman engine may offer a solution of the problem. The merits of this engine have been recognized in England. A brief description of the engine is given.

HAWAII

See

UNITED STATES — COMPULSORY MILITARY SERVICE

HEIGHT LIMIT

[A Plea for the Little Man. By Lieut. A. Carew-Jenkins, U. L. Senior Cadets. *Australian Military Jour.* Jan 1915. 1000 words.]

In an entertaining article, the author takes exception to the exemption from military service of all men under the required height of 5 feet 7 inches, quoting history of Alexander 4 feet 7 inches, and Nelson, small at beginning of his military career and smaller by an eye and an arm before winning Trafalgar. He points out the superiority of little men as orderly, cavalryman, cyclist scout, aeroplanist, telegrapher, cook, etc.

HEINRICH AEROPLANE

—Tractor Biplane

[Heinrich Military Tractor Biplane. *Aeronautics.* March 30, 1915. 1000 words, diagrams.]

Designed to satisfy the 1914 specifications of the United States Army, this aeroplane has been developed to meet the requirements of high speed, low landing speed, speed variation of more than fifty per cent, climbing power, good gliding angle, large degree of natural stability and economy of power. For military work the controls are duplicate. The 110-H.P. gyro motor, weight 270 pounds, developes a speed of 45-80 miles per hour. The climbing speed is 4000 feet in 10 minutes. The gasoline consumption is 10 gallons per hour, and a sufficient supply for a four-hour flight can be carried. The total lifting area of the main planes is 285 square feet. Seats are tandem for pilot and passenger, with ample room in front cockpit for one more person. Price, $7500.

HELGOLAND, Battle off

[The Naval Battle off Helgoland. Editorial. *Artill. Monatshefte.* Feb 19, '15.]

In the naval battle on Jan 24, 1915, the German fleet was composed of four armored cruisers, four small cruisers and two torpedo-boat flotillas; the English fleet consisted of five

battle cruisers, several small cruisers and 26 torpedo-boat destroyers. Since the fight was a running one at long range, only the battle cruisers entered into the decision. The muzzle energy of the big German cruisers was 556,204 mt.; that of the English battle cruisers 765,208 mt. But since the battle was fought at a range of from 15- to 20-kilometers only guns of 21 cm. and over entered into the decision which gave the English a 2 to 1 advantage. It is very probable that the English losses were as great as the German.

HELMETS

—Armored

[Metallic Headpieces in the Trenches. Editorial. *Lancet,* London, July 17, '15. 200 words.]

States that in 13 cases of head wound among those wearing these *calottes métalliques,* eight suffered more or less cerebral shock and five had merely superficial wounds, and others similarly protected received no injury.

[Armour for Battle. Anon. *London Times.* July 23, '15. 1000 words.]

The present war is reviving old methods. The steel fort has been discredited and the earthwork justified; the strength and direction of the wind are important in connection with aeroplanes and gas attacks; hand grenades and bombs have assumed importance; and the question of armor for the soldier has come up.

The French are about to supply a metal helmet to soldiers. Trench warfare has led to a preponderance of head wounds. The metal helmet has by practical test proved efficacious in preventing or lessening the severity of these wounds. The chief objection to the use of armor—loss of mobility—disappears in trench warfare.

[Helmets and Shields for Protection from Projectiles. France. *Revista de Artilharia.* July, '15. 160 words.]

Besides the small portable shields which the various nations had adopted before the war for the protection of sappers and of infantry in the trenches, the French had experimented with success on a metal helmet. They also had experimented on shields to protect the body in front and on the sides as well as the legs.

Dr. Devraigne, of the French Army published an article in the "Lancet" setting forth the result of experiments with the metal helmets. In 42 cases of head wounds where the helmets were not used there were 23 serious fractures of the skull. In 13 cases where men had used the metal helmet, there were eight cerebral hemorrhages and five superficial wounds, with no deaths. The use of the metal helmet will probably become general.

[Manufacture of Steel Helmets for the French Soldiers. Why and how two million of these head protectors were made in six months. By Jacques Boyer. *Scientific American,* Nov. 27, '15. 1200 words. Illustrated.]

The vivid coloring of the French uniform has given way to neat service uniform of gray, and the kepi has been replaced by a steel helmet. The reason for the latter change lies in the fact that in the trench warfare of the western front, it is stated that 13.33 per cent of all wounds of French troops have been wounds in the head. To reduce this percentage, a steel helmet, suggested by an officer named Adrian, was adopted, and the work of manufacture started immediately. To-day all men in active service wear them.

The metal helmets are made from sheet steel .7 mm. thick. The first operation is stamping out, and 63 more operations are required to complete the manufacture. Brims are soldered on. Experience shows that the helmets are effective in preventing injuries. Five factories, employing 500-600 men and about 2400 women, manufactured 2,000,000 of these helmets in six months.

HISTORY, MILITARY

See subhead HISTORY *under names of countries*

See also names of specific Wars, Campaigns, Battles, Sieges or other military operations.

HOLLAND

—Military defense of

[Holland's Plan of Defense. By Dr. R. J. Jessurun. *Review of Reviews.* Apr 1915. 1000 words, 1 map.]

The Dutch military system is planned principally for defense. The scheme involves an ultimate abandonment of most of the territory and a retirement of the forces behind the "New Holland Water-Line." This is a fortified line extending from the Zuiderzee at Muiderberg to the New Merwede near Geertruidenberg. Within the area thus enclosed is a shorter fortified line enclosing Amsterdam.

The strength of these fortifications rests not so much upon guns as upon a skilful utilization of the peculiarities of the country. Much of western Holland has been artificially drained, and is susceptible of quick and easy flooding.

The defensive lines have been so selected that an area about four miles wide in front of these lines can be flooded to a depth which can be regulated. The depth planned is less than a foot, not sufficient to float a boat, but sufficient in view of the spongy nature of the soil and the presence of numerous drainage and irrigating ditches, to prevent wading.

—Military Policy of—Defense of Dutch India

[The Defense of (Dutch) India. By Captain W. Muurling, General Staff. *Indisch Militair Tydschrift.* No. 7, July, '15. 3200 words.]

Apparently the security of (Dutch) India lies in a strong fleet. In reality, however, a strong fleet would be a menace rather than a protection. To build and maintain a fleet which could successfully cope with the other powers in the Orient would be beyond our financial possibilities, and an inadequate fleet would not only fail to offer protection, but would likely fall into the hands of the enemy and thus increase the power of our foes. Dutch India needs first of all a strong army for the maintenance of peace within her own border, and must be content with a small fleet to maintain her neutrality.

HORSE EQUIPMENT

—Field Artillery—Harness

See
HARNESS—FIELD ARTILLERY

HORSES

See also
CAVALRY
EQUITATION

South America

[A Study of Argentine, Chilean, and Peruvian Horses. By Col. E. Soyer and Lieut.-Col. P. Duroux, Peruvian Army. *Memorial del Estado Mayor de Chile.* 800 words.]

The Argentine Horse

There are about eight million horses in Argentina, but amongst them no pure breeds, except in possession of some few rich landlords.

The native horse is believed to be descended from those left in 1536 by Mendoza, and are of Arab extraction, with some other Asiatic blood. But the type has degenerated. Scattered and abandoned on the vast plains breeding has taken place under adverse circumstances, and those who have sought the Argentine horse expecting to find a magnificent animal have suffered a rude disillusionment.

Argentine proprietors are trying to improve the quality of the native horse, both for esthetic and commercial reasons. Although fulfilling rough farm necessities, the awkward appearance, malformation, and lack of intelligence displayed by these animals render them difficult to use otherwise.

The fame of the Argentine cattle leads to the hope that the horse will eventually be as notable, though it is recognized that the breeding of high grade horses presents many more difficulties than the improvement of breeds of cattle, and some of the intricate problems are enumerated, with the remark that the people of Argentina have understood but little of this science.

South America not offering a sufficient market for the output of Argentine horses, a market was sought in European countries, especially in England, Portugal, Italy, and Belgium, who need horses for their armies,—though the type is not always suitable for military service,—but only England has continued her purchases.

It appears necessary that the example of European nations should be followed, and that the government should assume direction of the breeding of horses. The problem is so vast that probably centuries must elapse before a radical reform can be effected through the millions of horses in the country.

The Chilean Horse

Of the same origin as the Argentine horse, the Chilean horse, as a consequence of greater care in breeding and raising, is now a superior animal. It is smaller than its ancestors but well proportioned. Its size renders it unfit for general draft purposes, and the government has undertaken its improvement.

During the war of 1879 between Chile and Peru, the Chileans had the superiority in mounts and draft horses, due to care in breeding and especially to the French blood in their animals.

The Peruvian Horse

Brought by the Spaniards in their period of conquest, it has the same origin as those of other South American countries, but, like the Argentine horse, has been allowed to deteriorate. There are about 80,000 in Peru, divided into two classes—the mountain type and the coast type—the former smaller and hardier than the latter. The article concludes with a technical discussion of these two types.

—Breeding of

[Breeding to Color and Conformation. Mendelism. By Vet. Robert Vans Agnew, 5th Cav. *Jour. U. S. Cav. Assn.*, July, '15. 2700 words.]

(A technical and detailed article on the subjects indicated in the title; not susceptible of satisfactory condensation.)

Sardinia

[Pure Blooded Arabian Stallions in Sardinia, *Rivista di Cavalleria*, May, '15. 6500 words.]

The calm and peaceful life of the island of Sardinia, which had pursued the even tenor of its way through so many political upheavals, was violently disturbed by two radical reforms. These reforms were: the division of the common lands and the abolition of free pasture. While these acts secured a new era of progress and activity for agriculture, they gave the death blow to the Sardinian horse.

At that time in Sardinia, beside the domesticated animals, there were others entirely at liberty living in numerous herds in the forests. These horses were hunted only for their hides, for no one ever succeeded in taming them. Unless the wild beasts died from self-imposed starvation they had to be killed on account of their wickedness.

Besides these there was another branch of half wild horses. Once a year in charge of their herdsmen, these were rounded up and taken to the fair at Oristano. These half wild horses kept on free pasture brought great profit to their owners without any fear of loss. Special laws placed on the landed proprietors according to their means the maintenance and care of a certain number of horses, and obliged them to forbid the service of public stallions to defective mares.

But with the abolition of the free pastures, the extensive grazing lands were broken up and the big herds scattered. The proprietors had to decrease the number of their horses or buy more land which rose rapidly in value until in twenty years it had increased 900 per cent. To obtain adequate returns for their lands, the tenants and owners had to cultivate their property and what little pasture was left was given up to beef and dairy cattle which brought in larger returns.

The preeminence of the Sardinian horse was due to two forces equally important,—environment and blood. The climate, pasture, and constant care all tended to preserve and better the breed. The other force showed itself in the transmissibility of those special characteristics so much sought after at that time, and which only the Andalusian sire possessed and transmitted in the highest degree. During the middle ages, an Andalusian was the most precious gift that could be offered to a sovereign. At the beginning of this century, this breed became rare. Its glory had followed the glory of Spain and fell with it, and when Spain desired good mounts for its cavalry, it was obliged to resort to crossing with English sires.

The decadence of the Spanish horse had an immediate effect on the Sardinian. Instead of the Spanish sires, the Islanders were obliged to use cast off stallions from Asia, Africa, and Spain. Many were imported by the government and several depots were established, the service of the stallions being offered free.

The zoological principle which was the constant guide of the hippologists at that time was scientifically correct: to give again the lost characteristics by the use of sires who had first transmitted and fixed them. But the difficulty was that there were no longer any good Andalusians, thereby necessitating a recourse to the great and ancient common sire, the Arab. The results were far from what had been hoped for. The following notes from the report of the Military Remount Commission show to how low a level the horse had fallen.

In 1865, a law was passed requiring every private stallion kept for service to be licensed. In 1880, in all Sardinia there was only one stallion authorized. In 1876, at a fair held at Oristano great difficulty was met in finding horses to whom prizes could be suitably awarded. The secretary of the prize committee states that the prizes were not given for any real merit but simply for encouragement.

Such was the result of a half century of breeding to Arabian sires. The faithful followers of the Arab however laid all the blame on a few northern bred sires which had been imported, making them the scapegoats of the ruin of the Sardinian horse. But on inquiry and analysis we find that the first northern stallions were not imported until 1860 when the Sardinian breed had already become degenerated. At the Royal breeding establishment at Bartigali at that time there were 60 stallions in all, 52 oriental and 8 northern bred. In 1867 these stallions were sent to Pisa, and it was not until 1874 at the Depot at Ozieri were there any other stallions than the Orientals. There were two at Ozieri, "Marcus Aurelius," an English thoroughbred, and "Christmas Day," ¾ English. The others were Oriental. These were the only non-Orientals on the Island. Does it seem that these few could be so virile in their service they could paralyze the half century of use of 200 Oriental stallions?

The mistake lay in holding that a pure ideal could be brought into practice by the rigid application of a zoological principle, without taking into consideration economical changes and conditions of agriculture and pasturage. They spoke of reinvigorating the Sardinian breed by the use of Andalusian sires, when no longer such a breed worthy of the name existed. The Andalusian was a saddle horse par excellence of remarkable grace and elegance. The old prelates and the gilded youths rivaled each other in securing these paragons, the demand for which far exceeded the supply. Even if Andalusians had been available, were they what was desired for Sardinia? By all means no. What the state wanted was a horse suitable for all the new requirements of modern cavalry. France and even Spain had recourse to England to save their horses from the miserable depths into which they had sunk. But Sardinia, blind to their example, desired to retrace their steps seven hundred years to the animals imported into Spain and Sardinia by the conquering Moors.

The Sardinian horse at this time rapidly diminished in stature, some claimed through change in environment. To me, however, appeals the report of a delegate sent to the international exposition of hippology at Paris: "Breeders and horsemen questioned at Paris lament that in crossing with Arabs, the colt retains the small stature and lightness of limbs even if well fed and cared for." To show the effect of the Arabian sires, let me observe from the report of Colonel Nobili and Luigi Gregori made in 1878. So great had been the number of Arabian sires used that all the horses in Sardinia should at that time be from one-half to five-sixths Arabian blood. In a district especially favored in pasture and where these Arabian sires were most numerous, the Military Commission inspected 633 horses for military requisition and found only 14 suitable for the army.

In travelling over the island, the most noteworthy horses suitable for military purposes were found on inquiry to be not of Arabian but of Northern bred sires, those horses held by most writers to be the least adapted to the island. The district of Ozieri boasted the greatest percentage of suitable horses in Sardinia, 1.11%. It was here that the Northern bred sires had been held at stud simply for experiment. In Ozieri it was soon found that all the breeders desired to use the only two sires in Sardinia that were not Arabian. The results were so satisfactory that in 1878, five more were added.

The result obtained at Ozieri was contagious. All the districts tried to obtain northern stallions for the use of their breeders. At last the secret of preventing the complete ruin of the horse in Sardinia had been found. For all the good the Arabians had done they might just as well have been Percherons.

(*To be continued.*)

Spain

[Report made to the General Committee of the Army Breeding and Remount Department, by its President (Director-General of the Department.) *Mem. de Artill.* (Spain), June, '15. 5000 words.]

HORSES—Continued

The tendency in rich countries is to specialize and produce a type of horse for each different use. On the other hand, a poor people must begin by making their types as homogeneous as possible, not attempting specialties.

Let us begin, then, by forming homogeneous standard breeds, as few as possible. The fewer and more pure the breeds we produce now, the better and more rapidly will we secure excellent results. Certain breeds, as the Arloff and Norfolk-Hackney, do not merit extension and should be eliminated.

Of the three parties interested in breeding—the breeders, the civilian consumers, and the army—the needs of the two latter may be easily reconciled. It is also easy to reconcile the interests of the breeders with those of the two classes of consumers, their interests, in fact, being the same.

The breeders should modify the form of their mares in the matter of obtaining a rectilinear type to replace progressively those of a convex profile. They should also grain their stock and work it moderately to assist in its development.

The oldest breeds, and, at the same time, those in best condition, are the Arab and the English. Related to each is the Anglo-Arab.

These three form the aristocracy of the saddle horse and appear to be those indicated for the stallion depots in Andalusia, Extremadura and in part in the Castiles. But should the native horse, which in an indefinite way possesses desirable qualities, be forgotten? Since the mares must necessarily be Spanish, they will transmit for many years both their good and their bad qualities. If it is desired (from sentiment more than from reason) to conserve or even to purify and define the Spanish breed, there will be no difficulty in purchasing types. In our military breeding depots, in which many and well-selected Spanish elements have been introduced, only very mediocre products have been obtained.

It follows, then, that we should use stallions of the very pure breeds and related half-breeds—English, Arab and Anglo-Arab. Very few Spanish stallions will be worthy of use. In what proportion should each one of the preceding four breeds enter?

The Arab is unfortunately so scarce and costly that it is impossible for us to enter in competition in the markets of the Orient on account of the limited resources of our Breeding Department. The Arab, therefore, cannot be the most numerous element in the composition of our depots.

Authorities are agreed against the production of the English breed for saddle purposes. Its form and temperament are developed at the expense of stamina. Besides, the English pure-bred and the Spanish more rarely produce good offspring. The Anglo-Arab should, therefore, form the base of our depots.

So much for saddle horses. Our artillerists, after various experiments, have fixed on the excellent Norfolk-Breton. They are completely satisfied with this horse. The breeding of this type should be encouraged in the Aragonese and Mediterranean provinces where horses of this type are most used. A depot should be created in Valencia which, with that of Zaragoza, would aid that of Hospitalet in the production of artillery horses, together with horses for agricultural uses.

In the same class comes the heavy work horse. There are in some districts of Aragon and Catalonia mares capable of producing this type, and large Percheron stallions should be provided in these districts.

—Care of wounded

See also

Blue Cross Society

—European War exports of from

United States

Figures compiled by the Department of Agriculture show that about 75,000 horses were exported from the United States during four of the early months of the war. On Jan. 1, 1915, there were 24,000,000 horses in this country. Three times the number exported during these four months would thus be less than 1 per cent. of our horse supply. But a small percentage of the animals exported were mares, and they were for the most part mediocre animals. England and France are the heaviest buyers. Early in the war both demanded light cavalry horses, from 14.3 to 15.1 hands high, but after the early months there was an increasing demand for heavy "gunners," artillery animals weighing from 1200 to 1400 pounds. British buyers required horses at least five years old, while the French use four-year olds and in emergency younger horses. The Department of Agriculture forecasts a big demand for horses after the war ceases. According to the best information obtainable, Russia had 25,000,000 horses before the war, and it is probably the only warring country that will not be drained of horses after the war. The United States and Russia have 50 per cent. of the world's horses, the total stock being estimated at 100,000,000.

—For Cavalry

[Endurance Race for Officers. *Jour. U.S. Cavalry Assn.*, July, 1915. 3500 words.]

An interesting account of an event originated in the 11th U. S. Cavalry, at Fort Oglethorpe, Ga., by Major F. C. Marshall of that regiment. This officer offered a cup for the winner of an endurance ride over a course unfamiliar to the competitors, of not less than 60 miles, the start not to be earlier than 3:00 o'clock p. m.

The race was run on April 27, 1915, by nine competitors, officers of the 11th Cavalry. It was won by Captain Frank Parker on "Q. E. D.", a bay gelding, 9 years old, 15-3 hands, sired by Panpankeewis (Virginia thoroughbred) out of standard-bred mare,—he came from the Front Royal Remount Depot. Captain Parker spent about 28 days in the training of his horse for the race, in work at the walk and trot; 1st week,—4 hours daily; 2nd week,—5 hours daily; 3rd and 4th weeks (except last 2 days),—6 hours daily.

Food:—oats and hay only, fed at first call

and 10:00 a m. whole; at 2:00 p. m. and 6:00 p. m. crushed and mixed with sugar (2 lbs. per day). Ration reached about 20 lbs. of oats after 1st week and was maintained at that. Hay regular allowance.

The total distance of the race was 75 miles, and the average speed of the winning horse was about 9 miles an hour.

—For Cavalry—Choice of Breeds

[A Voice from the Antipodes—What Horse for the Cavalry? By Col. Spencer Borden. *Jour. U. S. Cavalry Assn.*, Jan '15. 4200 words.]

Consists largely of quotations from European and Australian authors regarding the question of suitable types of mounts for cavalry use. Represents the modern "thoroughbred" as specially unsuited for this purpose and suggests the superiority of certain breeds found in Eastern Europe and Asia—especially the Arab.

—For Cavalry—Qualifications of

[Our Cavalry Horse. By I. de Oliveira Cézar, Colonel, Argentine Army. *Rev. Militar.* (Argentina) May, '15. 1500 words.]

Conformation, structure and temperament are the most important considerations in selecting the cavalry horse.

The conformation should follow the accepted model of a good saddle horse. The structure should be compact to permit the animal to gallop united under heavy loads. The temperament should indicate a good balance between the nervous and physical forces. Many years of experience, both military and civil, throughout Europe, have demonstrated conclusively that the "hunter" types are superior to all others for military service under the saddle. The prototype of this class is the Irish hunter, now closely approached by the French hunter, widely scattered throughout France and destined to replace all other saddle horses in the French army. Such types vary in height from 15 hands up and weigh from 900 to 1300 pounds. They possess great depth of chest, short back, plenty of bone and strong joints and tendons, and are able to gallop with loads up to 350 pounds.

Assuming that the Irish stock is of analogous origin to the primitive herds of our plains, it is reasonable to believe that by intelligent selection and breeding, Argentina could produce a pure line from which could be developed a good Argentine hunter, suitable for cavalry and able to compete with similar foreign types. This idea is supported by Argentina's experience at the European tournaments in 1909 when, with 16 horses selected from the ranks, it won many prizes in competition with military delegations from eight other nations. In the endurance ride at Brussels with 4 entries among 130, it captured 5th and 11th places.

—Transportation of

[Equine Questions. Anon. *Mem. de Artill.* (Spain), June, '15. 2000 words.]

On account of the war, the belligerents have made large purchases of horses in foreign countries. The English and French armies have secured, during some months, more than 21,000 horses from the Argentine Republic alone, the prices ranging from 120 to 130 pesos. The United States, Canada, and Australia are other countries which have exported large numbers of horses to the theater of war.

The transportation of thousands of horses is a new problem. It is impossible to imagine the amount of work represented by such an enterprise.

(The following description refers to shipments from Australia.)

Each horse is confined to a space so narrow that he cannot lie down during the voyage. The horses are separated by two bars—one high and the other low. A vacant space is left between each series of fifteen animals, which serves as a place to which the animals are taken in succession each morning to be cleaned. The planks under each animal are taken up, well cleaned and sprinkled with a disinfecting liquid and replaced. Water is given to the horses four times each day—at seven in the morning, at noon, at four in the afternoon, and at nine-thirty in the evening.

Each horse is given ten minutes' exercise on a track daily, except during rough weather. Seventy men are required all day for each three hundred horses, in order to give them ten minutes exercise each.

After four or five weeks of being constantly on foot, the animals become greatly fatigued, and if they get down it is difficult to get them up. To avoid this, a band of canvas is passed under the horse and attached to the high bars which separate the stalls on either side.

The *Blue Cross*, an English institution founded for the care of wounded horses susceptible of being cured, has actually in operation in France 12 auxiliary hospitals, each with a capacity of from 300 to 500 horses.

Large quantities of permanganate of potash are being used for dyeing gray and white horses to make them less visible.

HOSPITALS

—Field Tent

[New Ward Tent for Field Hospitals. By Capt. W. H. Smith, Med. Corps, U. S. Army. *Military Surgeon.* Apr., 1915. 1900 words, 1 sketch.)

A new ward tent has been devised and is under test. It is 49 x 16 feet, and is supported by four regular hospital tent poles. The ridge is formed by a rope. Four openings along the ridge in which are secured steel rings, afford ventilation. To these rings are secured by chains disks which engage the pin of the tent poles.

The advantages of the new tent are that it is larger than three hospital tents, weighs 250 lbs. less, requires fewer tent poles and pegs, is quieter, due to absence of flapping fly and creaking ridge poles, is more substantial and durable, and is easier to pitch. It is as comfortable in cold weather as the regular three-tent ward.

—In European War

France

[Ambulances and War Hospitals. *Paris Medical Jour.*, May 15, '15.]

HORSES—Continued

This entire number is devoted to the removal of wounded from the front, and the hospital care of sick and wounded of the French army.

[Military Hospital Care in War in the Zone of Advance. By Ch. Doper, Médecin-major de 1ère classe. Professeur au Val-de-Grace. *Paris Medical Jour.*, May 15, '15. 3400 words. 3 illus.]

Gives three modifications of tents for field hospitals, one a modified tortoise, the other two using the shelter tents fastened together.

[The Surgical Field Hospital of the Advance. By Anselme Schwartz, Médecin de 2e classes au corps colonial. *Paris Medical Jour.*, May 15, '15. 3000 words. Illus.]

Concerns the position of this hospital and the administration of the hospital.

[A Report for the Lightly Hurt, at the Front. By Letonturier, médecin-major de 1ère classe des troupes coloniales. *Paris Medical Jour.*, May 15, '15. 4000 words. Illus.]

It is intended to care for the lightly wounded and sick and the fatigued near their regiments. Speaks of the character of the service, how rendered, etc.

[An Evacuation Hospital at the Front. By Dr. P. Bibrio. Médecin aide-major de 2e classe. *Paris Medical Jour.*, May 15, '15. 2400 words. Illus.]

[Hospital Trains. By Dr. Horn. *Paris Medical Jour.*, May 15, '15. 4500 words.]

Ordinary service, intensive service, and transport in the zones of the interior.

[The Surgical Hospital Immobilized Near the Front. By A. Latarjet. Médecin-major de 2e classe. *Paris Medical Jour.*, May 15, '15. 1500 words. Illus.]

He thinks that much of this work should be done near the front, just beyond shell fire, gives an account of such a formation.

Then there follows an account of a new wheeled support for litters, the dogs for use by the sanitary corps, etc., hospital care in war in the zone of the rear, a long list of the military hospitals of the fortified camp of Paris, hospitals of the sanitary service, additional hospitals, auxiliary hospitals of the three French Red Cross societies.

—Railroad

See
Sanitary service — Transportation of sick and wounded—Hospital trains

HOUSES, Fortification of

See
Villages—Fortification of

HOWITZERS

See also
Field artillery—Materiel
Mountain artillery—Howitzers

—Field

See
Field artillery—Materiel—Mortars and howitzers

Great Britain

See
Field artillery—Materiel—Great Britain

HSIAO-SI-ERH, Engagement at

[Studies in Minor Tactics. The Fight at Hsiao-si-erh. By A. F. B. D. *United Service Mag.* Apr., 1915. 3200 words, 1 sketch map.]

General Situation.—The right of the Japanese army, consisting of one division, was advancing against Chiaotou, where a strong Russian force was reported. One regiment was left behind to guard the rear of the column against two Cossack regiments known to be near Hsiao-si-erh.

Combat.—One Cossack regiment had pushed forward cautiously. The Japanese regiment sent out one battalion to drive in the head of the Russian advance, with orders that should this prove a detachment only to continue on and observe the Cossack force at Hsiao-si-erh. The battalion advance guard consisted of one company. The advance was down the narrow, gorgelike bed of a fordable stream flowing north into the Tai-tzu-ho at Hsaio-si-erh. The advance troops were fired on as they debouched on the road out of Hsa-mia-pu. The Cossack regiment had, on the other hand, been directed "to check the farther advance of the Japanese; but if they did not advance, to return to Hsaio-si-erh, leaving one sotnia in observation." The main force was posted on a long, flat spur at a defile on the west side of the stream, with an observation section on the peak on the oposite side. The outpost sotnia that opened the fight was situated on a similar spur a mile south also on the west bank. One Japanese section advanced against the front of the outpost position, while the other two made a wide turning movement to the left. This forced the Cossacks to retire across the stream and take up position near the observation section. The advance guard did not pursue, being two hours ahead of the main body. It held the spur with its right, while the rest of the force extended along the edge of the woods on the northwest, until stopped by part of the Russian force occupying a hill on their line of advance. When the three companies composing the main body arrived, they took up the following position: one company straddled the stream, extending on both sides; another was held in reserve on the west bank; while the third started to envelope the left of the Russian position. By this move, the outpost sotnia on the east bank was forced to retreat. The main position on the other bank was thus enfiladed, and after some loss this body also was forced to retire on the rest of the brigade, a mile north at Hsaio-si-erh.

Comments.—The order to the Cossack regiment, as quoted above, was faulty. "The whole order seems to evince no very clear plan, no definite intention with regard to either the action of the brigade as a whole, or the rôle

to be played in it by the advance regiment, and . . . the recipient, the colonel, must have been left wondering what was the object of the resistance he was ordered to offer, how vigorous it was to be, how long it was to last, and how it was finally to end." The colonel seems to have decided on a rear-guard action, but as such the fight was maintained too long. The whole force should have retired when the outpost sotnia retired from the east bank. The Japanese sent out their advance guard as early as two hours ahead of the main body because the road lay through a very hilly and narrow valley, with the enemy close at hand, so that the main body should not be checked and delayed at short intervals. The advance guard action forms a model. Its mission was to drive in the enemy's advance troops and investigate beyond. This was accomplished by a combined frontal and wide flank movement. After this success by holding the road and valley, and at the same time extending their left toward the main Russian position, the attention of the enemy was held so that the advance and deployment of the main body was unnoticed in the opposite and unexpected quarter on the east side of the stream.

HYDROAEROPLANES

[Vincent Astor's Seaplane. *Flying*, Sept, '15. 800 words. Illustrated.]

The seaplane built by the Burgess Company for Mr. Vincent Astor conforms in general to the Burgess-Dunne seaplanes built by this company for the United States Army and Navy.

The wing pontoons carry their share of the load only at slow speeds. As the speed increases the single main pontoon planes upon the surface, lifting the wing pontoons well above the water.

The machine was not designed for either the excessive speed or great weight carrying capacity of the military planes. Fully loaded, the machine weighs about 2400 pounds. Its maximum speed is about 65 miles per hour.

The machine is housed in a floating hangar. By an ingenious arrangement, consisting of a differential hoist and two trolleys supported on a steel I-beam, the machine is lifted from the water and run into the hangar.

See also
Aeronautics
Harriman hydroaeroplane
A. E. G. hydroaeroplane

—Altitude Records

[*Army & Navy Jour.* May 1, 1915.]

A new world's record altitude flight of 10,000 feet in a hydro-aeroplane was made at Pensacola, Fla., by Lieutenant P. N. L. Bellinger at the naval aeronautical station. The ascent took one hour and twenty minutes, the descent sixteen minutes. On June 13, 1913, Lieutenant Bellinger made the best previous record for an altitude flight in a hydro-aeroplane at Annapolis, when he climbed 6,200 feet.

[Note. *Army & Navy Jour.*, Nov. 6, '15. 75 words.]

A new navy hydroaeroplane altitude record of 11,000 feet was made at Pensaloca, Nov. 4, by Lieut R. C. Saufley, U. S. N. The ascent was made in 40 minutes and the descent in 15 minutes.

HYDROGEN

—Production of—For Balloons

[The Production of Hydrogen in War. By Dr. A. Sander. *Kriegstech. Zeitschrift*, May-June, '15. 6000 words. 7 photo prints.]

Recent developments in the construction of aircraft have not entirely succeeded in displacing the captive balloon. In fact, in the present conflict the fixed balloon is an important adjunct of the heavy artillery. It is also extensively used for observation purposes. The all-important feature in the balloon service has been the production of hydrogen in sufficient quantities and without undue delay. There are many types of portable producers, but for German conditions it has been found that the best method of bringing gas to the balloon is not to bring the producer to the front, but to send forward the hydrogen in steel flasks. These flasks hold 36 litres of gas at a pressure of 130 atmospheres, which corresponds to about 5 cubic meters of balloon space. Since the usual fixed balloon holds 600 cubic meters, it requires 120 flasks for one filling. The flasks are transported in caissons, 20 to each vehicle, and it is so arranged that all six caissons can be coupled up together when the balloon is filled. In this way the time of filling is reduced to about 20 minutes.

In the Russo-Japanese war the Russians made use of producers. One type was heavy and cumbersome, but suitable for level country; the other was put in small portable units. Both were of the same system, however. The process was based on the well-known action of aluminum on sodium hydroxide. This method presupposes an ample water supply, and has the drawback that it requires 5½ kg. of materials for every cubic meter of hydrogen produced. The apparatus consisted of sheet-metal containers, each of which was partly filled with sodium hydroxide. The aluminum chips were held in a gauze drum, a portion of which rested in the liquid. From the producer, the gas passed through the washer and from there into the balloon.

A similar producer was developed by Schuckert & Co., of Nürnberg, for the Spanish government and found use in the Morocco campaign. The only difference lay in the fact that in this case silicon instead of aluminum was used. At temperatures of from 80° to 90° C. the action of this element and sodium hydroxide is energetic. The temperature need not be attained by the use of fuel, if the natural development of heat during the preparation of the hydroxide solution is utilized. These producers were built in varying capacities of from 60 to 250 cubic meters per hour. Two kilograms of materials are required for each cubic meter of gas.

The French have adopted a similar construction, only in place of silicon they have used ferro-silicon. This apparatus is called "Silicol" and produces 400 cu. meters of gas an hour with 1.9 kg. of material for each

HYDROGEN—Continued

cubic meter of hydrogen. The cost per cubic meter amounts to about 20 cents.

Still another method of French origin is the so-called "Hydrogenit" process. This is particularly adapted to use in places where water cannot be obtained in great quantities. "Hydrogenit" is a mixture of finely powdered ferro-silicon and sodium-calcium oxide. It is a gray, sandy substance, which burns, even in a closed receptacle, with a great production of hydrogen. Three kg. of this mass deliver about one cubic meter of hydrogen. The latter is in a very pure state and has a lifting power of about 1.19 kg. per cu. meter. The "Hydrogenit" is ignited by means of a small amount of ignition powder. It comes in sheet-metal containers and is said to keep indefinitely at normal temperatures. These containers are placed bodily in the producer and fired. The producer is surrounded by a water jacket, the contents of which are converted eventually into steam. Towards the end of the process, the steam is shot into the chamber to accelerate the action. The gas is washed in water and then dried by passing through screens of sawdust and coke. The cost is about 32 cents per cubic meter of gas.

Still another system of French make is the "Hydrolith" process. This method is well suited for portable producers, one having attained a record of 160c cu meters in per hour, but the accompanying cost of one dollar for each cubic meter of gas is rather prohibitive.

So far only portable outfits have been considered. The producers to be found in permanent installations differ considerably from those designed for field work. In this case the question of economical production assumes new importance, and that of capacity may be regulated by storage facilities. The methods used are many and they differ one from the other in principle as much as those employed in the portable outfits.

The installations manufactured by the Schuckert Co. and the Oerlikon Machine Works both use iron electrodes in an alkaline electrolyte. They differ only in the details of construction. In this method the hydrogen given off at the cathode is separated from the oxygen generated at the anode by a partition. The electrical current used amounts to about 6 kw. hours for each cu. meter of hydrogen produced.

The International Hydrogen Corporation of Berlin has perfected the old method of producing hydrogen by passing steam over red-hot iron filings. A porous iron-sponge is made by the reduction of burned silica pebbles with water gas. This is heated to 800° C. and then sprayed with steam. The latter is dissociated with a resulting freeing of hydrogen. The cost is very low, being about 3 cents for each cu. meter of gas.

An entirely original method has been invented by two Dutch engineers—Rincker and Wolter—and is used both in Germany and Russia. This process utilizes the gas produced from the products of fractional distillation of crude oil and tar. The gas is passed through a layer of hot coke whereby the hydrocarbons break up with ultimate freeing of hydrogen. The product delivered contains from 2 to 3 per cent carbon monoxide, which is removed by subsequent treatment with hot sodium oxide. This process is applicable for the use of either oil-gas, crude oil, petroleum by-products, tar, benzol or benzine. Two men can run the entire apparatus, and the cost of production is not over 3½ cents per cubic meter of hydrogen. The Russians have a complete equipment mounted on two flat cars which is moved around to suit the convenience of the balloon detachments.

ILLUMINATION

See also

SEARCHLIGHTS

ROCKETS

—For Night Attacks

[Illumination for Night Attack. *Army & Navy Jour.* May 1, 1915. 350 words.]

A search light primarily for field artillery has after test at the school of fire been found wanting. The proper solution would appear to be found in the use of search lights supplemented by flare bombs.

—For Signalling

See

SIGNALLING—VISUAL—BY ILLUMINATION

INCENDIARY BOMBS

See

BOMBS—AERIAL—INCENDIARY

INDIA

See also

DUTCH INDIA

—History

See also

NATIVE UPRISINGS—MILITARY HANDLING OF

—Military conditions

See

MOUNTAIN WARFARE

—Navy—History

[The Royal Indian Marine. By Commander E. J. Headlam, R.I.M., F.R.G.S., F.R.M.S. *Jour. of the United Service Inst. of India.* Jan., 1915. 14,000 words.]

The Indian Navy has an interesting history. It participated in actions against the Arab pirates in 1835, in the operations on the Indus and in the attack and capture of Aden in 1838.

In the war against China, in 1840-41, it participated in the chief engagements, which included the capture of Chusan, the blockade and capture of Ningpo and Canton, and the taking of Amoy, Woosung, and Chinkiang-fu.

In 1843, a squadron took part in the battle of Miani and the capture of Hyderabad. The service was also represented in the military operations in New Zealand in 1845.

In 1852, a squadron of the Indian Navy participated in the Burmese war, and during that war likewise co-operated with the Royal Navy in an expedition against the Sulu pirates.

Between 1849 and 1854, the Indian Navy probably attained its highest state of efficiency. Its complement of officers and men was complete, its ships were modern and in good condition, and its dockyards were busy.

—Red Cross

See

RED CROSS—INDIA.

INFANTRY

[*Note, for a rapid survey of the material under* INFANTRY, *that it is distributed on the pages indicated under the following geographical and subject subheads:*

Note also for much other valuable material on INFANTRY *the cross-references, not only after the General material under this head, but also after the material under many of the* INFANTRY *subheads.*]

United States

[Impressions of Service with the 2nd Division in Texas. By Col. R. L. Bullard, 26th Infantry. *Infantry Jour.*, July-Aug. '15. 2400 words.]

Military organization extending through hundreds of years has reached the division as the unit for execution. Using it we have done well, rejecting it we have failed. Twice, single brigades of this division have been detached, many times single regiments, battalions, batteries or lesser detachments have been sent away. Query—Are we up to the largeness of the division organization? Do we know how to use it?

The field uniform is by consensus of opinion the best we ever have had. The Infantry would part joyfully with its "cuff" leggings and its cryptic red, white and blue flags. No use can be made of these latter to justify their cost and trouble. Our signaling for the last thirty years in line troops has made no progress. The camp kettle and shelter tent that shelters without disarming are warmly greeted. Supply, not tactical training as given in orders, is the prime immediate need of the army. The enemy in maneuvers is not allowed to capture the supply officer! We must remedy this. Let us have the officers and men and a good School of Supply. Reveille and taps seem ripe to go the way of check after taps. Boards of officers are ponderous, slow, inconclusive things, and from their very nature seem inappropriate to a military organization which operates under one head. A witty definition says a board is a long flat wooden thing.

Nine months of full training causes the recruit quickly to disappear. A combination of garrison and training period into one six months' period of double work showed the division how to do far more than it thought it could and left it proud of its efforts.

Formal guard duty might well go, having lasted from Caesar's time and earlier conditions. How we pride ourselves on individual cooking, never to be used again! The Infantry pack is successfully launched. A real maneuver lasting ten days was the closest simulation of a real campaign ever waged. Polo has taken hold. Training in fencing with bayonet and sabre arouses interest and the first fencing competition ever held in the army will be held this year.

—Arms—Ammunition

See also

BULLETS

DUM-DUM BULLETS

—Arms—Ammunition—Manufacture of

[A Light Cartridge Case. (Prof. Notes.) *Kriegs. Zeitschrift*, Mar-Apr, '15. 100 words.]

Every military nation has been seeking a method of reducing the weight of the cartridge case. At present the useless weight carried in the cartridge belt amounts to from 30 per cent to 40 per cent of the total weight of the ammunition. Aluminum cases have been unsuccessfully experimented with. Another method is to make the cartridge case of some combustible material. The latest development along these lines is the invention of a Swiss engineer, Schoops. His process is based on the fact that molten metal can be sprayed on any sort of a backing. It is deposited in fine particles. The spraying is done by means of compressed air. Paper cartridge cases are sprayed with metal and are said to be both light and efficient.

[The Manufacture of Cartridges. By M. da S. G. F. Temudo, Lieutenant of Artillery.

INFANTRY—Continued

Revista de Artilharia, Aug., '15. 8900 words. Tables included.]

(A technical discussion of the manufacture of cartridges for small arms for which reference must be made to the text.)

—Arms—Bayonet

See

BAYONET

—Arms—Grenades

See

GRENADES

—Arms—Rifle—Automatic

See also

MACHINE GUNS

[Automatic Machine Rifles. *Illus. London News*, July 10, '15. 1300 words. Illustrations of Lewis and of Hotchkiss machine guns.]

[These two guns are employed by the Allies; the British and Belgians use the Lewis, the French the Hotchkiss. Since the description of these two guns and of their action closely follows the illustrations, review of the article is impossible here without the reproduction of the illustrations themselves.]

[Development of the Infantry Weapon. *Norsk Militaert Tidsskrift*, Mar., '15. 1300 words.]

[Note.—This article is given in practically full translation.]

The question of arming the infantry with an automatic rifle is still open for discussion. The great war has come without any nation having made the radical change in its infantry which the adoption of the automatic rifle would necessitate.

Certainly this is the time for discussing the problem, which involves not only a change in the weapon but also a complete change in the art of handling the infantry.

When the development of the rifle has reached a point where the next step leads to the automatic mechanism, it would appear logical that the automatic military rifle should have its turn. This eventuality has been before us for some time, and it has been reported that the great nations have their models finished and that one of them—France—had determined to introduce the automatic rifle as soon as it had completed re-arming the field artillery and organizing the machine gun detachments, say in a couple of years. But no change in the weapon of the infantry has yet taken place.

A process of development may be carried out by improving the details of existing material and methods, but there comes a point where it is advisable to turn to entirely new material and methods. Such is the case with the weapon of the infantry. There has been a development of the mechanism from the muzzle-loader to the breech-loader, and thence to the magazine rifle. The next step should now be the automatic rifle.

To undertake the re-armament of the infantry involves enormous expense. It is therefore natural to seek to increase the effectiveness of the old rifle by improvements in ammunition, and to exhaust all other means of increasing infantry fire effect before re-arming the entire infantry force. This is exactly what has taken place in the past few years.

Only a few of the great powers have especially new rifles,—England, Japan, and the United States. No power has succeeded in reaching a point of development of the army rifle beyond the magazine mechanism, but they have tried in other ways to increase the fire effect of the infantry.

During the past few years great attention has been paid to ammunition, powder, and pointed projectiles. By these means the efficiency of the old rifles has been raised enormously. Of the French rifle, it is said that the adoption of pointed bullets equalled the introduction of a new rifle. A still more improved type of ammunition (balle Derguesse) was about to be adopted by France when the war broke out.

Another means of increasing the fire effect of infantry is to add to it that of machine guns. Tending at first strongly toward the artillery, the development of the machine gun has drawn it closer and closer to the infantry and cavalry, and it now belongs entirely to these arms. The necessity to make their relation more intimate has favored the development of lighter and lighter types, which permit them to be part of the infantry arm, rather than the heavier types which, on account of their greater demands for means of transportation, tend toward separate and distinct tactical organizations. By developing along this line, the infantry has gained an automatic rifle, but not a one-man automatic rifle. Time will show how far we can go along this line.

The requirements of an automatic weapon fully adapted to use in the infantry are (1) that it be not too heavy to be carried wherever infantry goes, and (2) that it have easily available sufficient ammunition to give full effect to its special characteristic, rapid fire. The last requirement is that which determines the difference between automatic and non-automatic military weapons. The non-automatic rifle is a one-man rifle, while the automatic is not.

The non-automatic rifle makes great demands upon the ammunition column. The demand of the automatic rifle is not only greater in degree, but it involves as well a different method of supply. While a company now has an ammunition cart, and in some armies (European) one or two pack animals to carry its entire ammunition supply, an automatic weapon must (every one or two weapons at least) have its own ammunition source constantly with it. In other words, the automatic rifle, though it may be manipulated and fired by one man, needs the services of several men and transport animals. It is not a one-man weapon. This shows that there is a limit to the number of these weapons that can be supplied to the infantry.

The infantry can hardly be changed to automatic rifle shots with their assistants. In such a case it would of course be the assistants who

would have to be depended upon for aggressive action and for the charge. It is possible that the tactics of the future will be confronted with this condition. Such an organization would never be able to solve the many problems which the infantry will always find in war. The infantry must be mobile, and the result will perhaps be the division of it into two parts—one armed with the one-man rifle and representing mobility, and the other armed with the automatic rifle and representing great fire effect.

The limit to the introduction of automatic rifles in the infantry will depend upon the relative weight given to increased fire action and to the other infantry functions which do not primarily demand heavy fire action. Tactical demands will decide this.

As recent wars have developed the offensive to a point far beyond any former ideas, it appears that the infantry will continue to be the close range arm, and the arm for night attacks. The one-man rifle with bayonet will therefore continue to be the principal weapon of the infantry.

Considering the fire fight alone, the further development of machine guns is of the greatest importance, i. e., their improvement in accuracy, certainty of functioning, and in portability, as also the increase of their number with the infantry to the limit determined by other infantry work.

Recently special weapons such as portable throwing bombs, rifle grenades, and hand grenades, have been given to the infantry for close range work. Before the war, this special material was still in the experimental stage with a multitude of models and schemes, but without any system worked out for their supply to or use by organizations. It had just begun to be considered in tactical regulations, but this material has been used to such an extent in the present war that there will certainly be system and method in its future use, thus further increasing the fire effect of the infantry without a general re-armament.

Broadly viewed, the present infantry armament is as follows: The development of the rifle has reached the magazine type. The latest models are simply improvements in the magazine feature. The development of the ammunition has reached the pointed projectile with high power powder, and the later types simply show a higher muzzle velocity with more favorably formed and weighted projectiles. There is still plenty of room for improvement in ammunition. The machine gun has been added to increase the fire action of the infantry, and short range weapons and hand grenades have been added for close range work.

With the possibility of further improvement in present weapons and ammunition, it appears that the question of the automatic rifle still belongs to the future.

If the automatic rifle ever replaces the magazine rifle, its adoption as a one-man rifle will demand such an enormous addition to the infantry combat train that infantry tactics will have to be changed. The mobility and offensive power of infantry will be materially modified. It may be questioned whether the automatic rifle can be used with the bayonet. Such a complicated mechanism will possibly not stand the rough handling incident to bayonet work.

A great factor in deciding a change to the automatic rifle will be that of expense. To the cost of supplying the new rifle must be added the cost of a considerably increased ammunition reserve, the cost of an increased train material, extra courses of instruction for all personnel affected, and extra courses of instruction for reserves. All these items will swallow sums so great that increased fire effect must be sought by improvement along different lines.

The automatic rifle belongs to the future, when all other means of increasing the fire effect of infantry have been exhausted, and when change of tactics, improved means of transportation, and greater ammunition supply will make it possible to get full effect from the weapon.

[The Doom of the Rifle. *Arms and the Man,* July 8, '15. 250 words.]

The automatic, or, properly speaking, the semi-automatic, shoulder rifle as a substitute for the hand-operated arm is inevitable. Incidentally, artillery of all kinds will increase, cavalry disappear, infantry as infantry be reduced, though increased in efficiency.

—Arms—Rifle—History of

[The Development of the Modern Rifle. By General George W. Wingate. *Arms and the Man,* Sept. 16, '15. 4500 words. To be continued.]

(In this installment, the author starting with the *bow,* brings the development down to the XVI century.)

[The Development of the Modern Rifle. By Gen. Geo. W. Wingate. *Arms and the Man,* Sept. 23, 30, '15. 4800 words. Illustration.]

(In these numbers, General Wingate describes the wheel-lock, the flint-lock, the muzzle-loading rifle, the smooth-bore musket, the percussion cap, and the long-range muzzle-loading rifle.)

[The Development of the Modern Rifle. By General Wingate. *Arms and the Man,* Oct. 7, 14, 21, '15. 7000 words.] (To be continued.)

Breechloaders appeared almost simultaneously with firearms, but remained a failure until the invention of a metallic shell. This prevented the escape of the powder gases through the breech mechanism; the ammunition, moreover, was waterproof under rough handling. Among early rifles may be mentioned the Burnside, the Spencer, the Henry (the ancestor of the modern Winchester); the British Enfield, when first converted, was known as the Snider; it used a bullet of 530 grains with 75 grains of powder. Its range was about 1300 yards, but it was not accurate beyond 800 yards. The Snider was followed by the Martini-Henry. In the United States the Springfield, when converted, became

INFANTRY—Continued

"needle guns," not to be confounded with the rifle of the same name invented in 1849 and used by the Prussians in 1864, 1866, and 1870-1871. This Prussian needle gun ignited a paper cartridge by driving a needle through the charge to the fulminate placed next to the base of the bullet. This needle was constantly getting destroyed by the action of the powder.

The establishment of the National Rifle Association, in 1870, led to a great improvement in rifles. It is certainly a singular thing that in spite of the lessons of our history, no attempt had been made in the United States to teach either regulars or guardsmen how to shoot until the formation of the association just mentioned. When the Creedmoor range was opened in 1872, a development of rifle practice was created in the New York National Guard, and a system of instruction introduced. At first, this system was looked on with disfavor, but rapidly worked its way up, and was adopted by the Regulars and by most of the State forces. This was largely due to the interest created by the international match between the Irish Riflemen and a team selected from the Amateur Rifle Club. The match was won by the Americans, thanks to the excellent rifles furnished by the Sharpe and Remington people, and to the development of the "team system." [Full details of this match are given, for which we must refer to the original article.—ED.] Other international matches followed, with what was called the "match rifle"; this rifle gave way, about 1877, to the military rifle, which has since been the weapon in all matches.

The Government was slow in taking advantage of the progress made in rifle shooting. General Abbot, however, in command at Willett's point, near Creedmoor, took great interest in the subject, and established a range of his own. Several general officers, among them Terry and Ord, took up the matter, and did all they could to interest their men in rifle shooting after the New York method. But it was several years before the Ordnance Department began to take notice. It is difficult at this time to appreciate the hidebound conservatism and want of enterprise which before 1873 characterized the Ordnance Department in respect of rifle shooting.

[The Development of the Modern Rifle. By Gen. Geo. W. Wingate. *Arms and the Man*, Oct. 28, '15. 1500 words.]

(This instalment is devoted to a description of the old 0.45 caliber Springfield rifle, to some personal recollections of the author, and to a very brief non-technical account of the origin of smokeless powder, with some remarks on the action and qualities of modern powders. The revolution wrought by its introduction into the military service is noted)

[The Development of the Modern Rifle. By Gen. Geo. W. Wingate. *Arms and the Man*, Nov. 4, '15. 1000 words.]

Sportsmen prefer a lever arm, such as the Winchester, but in the service a bolt action must be had, as it can be more easily manipulated by a man lying down. The first magazine rifle issued (1894) to the Army was the so-called Krag-Jorgensen. This was superseded in 1903 by the "new Springfield," which became as well the weapon of the Navy and of the National Guard.

"It appears like a toy compared with foreign military rifles or even with the .45 Springfield, being but 3 feet 7 inches long, with a 24-inch barrel (about half the length of that of the Kentucky rifle) and a weight of but 8.69 pounds—about that of the old carbine, which, in fact, it much resembles. Its bore, twist and grooves are the same as those of the Krag.

"The charge is from 47 to 50 grains pyrocellulose composition, the grains being cylindrical, perforated and graphited (to avoid fouling). The bullet weighs only 150 grains, permitting the soldier to carry many more cartridges than he could of the larger caliber. It has a muzzle velocity of 2700 feet per second," which gives an accurate fire up to 1500 yards, and a total range of 2½ miles. "The cartridge shells are of brass, central fire and crimped around the base of the bullet so as to be waterproof.

"The bullet is made of lead hardened with tin and is enclosed in a cupro-nickel jacket so as to stand without stripping the tremendous friction that it is subjected to in being forced through the grooves of the barrel by the pressure of the gas from the smokeless powder, which runs up to 51,000 pounds to the square inch, and which pressure expands and shortens the bullet.

"The rifle is worked on the bolt principle, and has a magazine which holds five cartridges in a clip which is slipped into a slot in the top of the receiver, and is consequently capable of very rapid fire. Sixty cartridges in twelve clips are carried by the soldier in a bandolier or belt which is supported by shoulder straps. The bandolier full weighs 3.88 pounds. Twenty-five aimed shots can be fired in a minute if the magazine is used, and twenty-three if it is fired as a single-loader. At 1000 yards its mean deviation is only 9.6 inches. The bullet will penetrate 59.98 inches of pine boards at 50 feet, and 10.48 at 1000 yards. At 600 yards the (maximum ordinate of the) trajectory is only 3.27 feet and at 1000 yards 14.48 feet. Its sights have a peep opening as well as a V, and a wind gauge on the rear sight. They are excellent and have been greatly admired by Europeans. The gun being so light, the recoil is severe (14.98 foot-pounds) and the report is loud. If a Maxim silencer is used (which is a tube made on the principle of a muffler in an automobile, and screwed on the end of the barrel) the report and, what is more important, the recoil, are largely eliminated. This is therefore used considerably in the instruction of recruits who become disconcerted by the heavy recoil. Great difficulty was experienced for a long time with this rifle, from the deposit in the barrel of a metallic fouling which required a chemical solvent to remove. As soldiers in the field cannot carry bottles of acids, much thought was devoted to getting

rid of this. It has largely been accomplished by a change in the material in the primer of the cartridge.

"This rifle is generally believed to represent the latest and best ideas on the subject. Various improvements are, however, being rapidly originated. In this rifle, as in the Krag, there was another departure from precedent in that the trigger pull was from 3½ to 4 pounds, as against 6 pounds of the .45 Springfield and a much heavier pull in its predecessors. The 3½-pound trigger pull is what is usual upon sporting arms.

The Canadians use the Ross rifle, caliber 0.303 the same as that of the British service.

[The Development of the Modern Rifle. By Gen. Geo. W. Wingate. *Arms and the Man,* Nov. 11, '15. 2000 words. (Conclusion.)]

The pointed, at least the cone-shaped bullet, was used 50 years ago by the Berdan Sharpshooters, as well as by the National Guard in the '70's. Both of these bullets were useful only at short distances. The sharp-nosed bullet came into its own when it was discovered about 1907, that its correct form called for one-third cylindrical body, and two-thirds point. Another result was the "humaneness" of this bullet. It is remarked, however, that in big-game shooting it is very destructive against soft-skinned animals. [The article closes with a popular description of the standard sporting rifle, and prophesies that "but a few years are likely to elapse before our present elaborate theories as to weapons will be proved to be erroneous, and our most valued rifle as antiquated as the long bow and the matchlock."]

—Arms—Rifle—Manufacture of

[Hollow Bars for Rifle Barrels. *Arms and Explosives.* Feb., 1915. 650 words.]

Through a bloom or billet is drilled a comparatively large hole, which is then filled with a secret cementlike composition sealed by steel caps electrically welded to the ends of the bloom. This latter is then heated and rolled until the desired section is obtained. The end cups are then removed and the densely compressed cement filling blown out. The hole is neither perfectly circular nor mathematically central, but subsequent machining removes, it is claimed, these defects.

[Demand for Gun Stocks. *Arms and the Man,* Aug. 5, '15. 150 words.]

The demand for material for gun stocks has been such that it is believed that many rifles have been sent out to the European armies with stocks improperly seasoned. Experts claim that not less than two years should be the time for this, and it is evident that the necessary seasoning has not been given many; and also that quantities of stocks have been cut from what would otherwise be waste material.

—Arms—Rifle—Sights

[Military Rifle Sights. By Edward I. Crossman. *United Service Mag.,* Jan '15. 4000 words.]

The fighting man's rifle might be much improved if sight designers took a course in target shooting and also observed field firing. Most military sights are unsatisfactory to riflemen. Having had experience with the peep sight set close to the eye, the open kind, or even the peep set farther away as on the U. S. New Springfield, are out of the question. The sight designer does not please a certain group of riflemen if he turns out a strictly fighting sight shorn of micrometers and wind gauges for minute settings; he displeases another group if he turns out a target sight.

The task of the modern rifle designer is this: he must evolve a rear sight that will stand the hard knocks, the sand and rust of a protracted campaign. It must be easily moved, must lock itself, must afford readings visible if possible to the file closers and its manipulation must be plain.

The sportsman finds the peep sight the best even in the roughest country. It is the simplest of sights and most accurate. With it there is no question of a fine or coarse sight, and light changes do not affect it. The objective is well defined through a peep properly placed and of proper size, even if it is heavy rimmed. The front sight, the objective, and the country for miles around are plainly visible.

There are peep sights that are useless for fighting such as that on the U. S. New Springfield. Here we have a small hole from 8½ to 10 inches from the eye. The objective is invisible in anything but a good light; and the sight is evidently a compromise with the target man, and consequently is not fit for either fine target shooting or fighting.

For fighting conditions, the peep sight of proper size and properly placed is as three is to one compared to the open sight. This is due both to distinctness with which the front sight can be laid on the objective and the lack of conscious effort to get the front sight in line with the rear one.

The ideal fighting sight should have a quick, self-locking, and easily released elevating arrangement, with large plain figures for range marked at stops. A press button release for 50 yard divisions and a fine micrometer for splitting these divisions would be an excellent scheme. For fighting the micrometer need not be used.

The U. S. New Springfield has a multiplicity of aiming notches and apertures. With the leaf down there is the battle sight. With the leaf up there appears to the green man—such as will have to be trained in a hurry for war—a notch in the very top of the leaf, cut in the transverse bar; a notch cut in the top of the slide itself; a triangle milled out in the slide, with a notch in that, and an aperture in the leaf below.

A wind gauge should not be left off. It need not be used in battle, and if well designed, as on the U. S. New Springfield, it will not be harmed by rough usage. There is no reason for the rear sight to be on the barrel. It can be contained on the bridge.

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With the peep further back we gain a longer sight radius, apparent greater size of aperture, and clearness of sight definition.

The U. S. Springfield front sight is too narrow, which is true of most military front sights. The knife blade shape is bad. Nine-tenths of errors in firing are in elevation. Some of these lie in faulty range estimation, some are due to the inaccuracy of the range marks, and some to the inability of the soldier to define clearly his objective. The best possible front sight to eliminate as far as possible these errors is the flat top or bar front sight. And such a sight has very small tendency to increase lateral errors. With a too narrow front sight the focus of the eye must be changed to see it properly with respect to the objective. With a 24-inch barrel a front sight of not less than .08 should be used.

[Military Rifle Sights. *Arms and the Man,* June 24, '15. 4500 words.]

[A popular article, in which, among other things, the author finds fault with the sights of the U. S. New Springfield. The peep is too far from the eye.]

[Improved Front Sights for Springfield and Krag Rifles. By Thomas Martin. *Arms and the Man,* Sept. 30, '15. Illustrations. 1000 words.]

Objection is made to the thinness of the Springfield and Krag front-sight blades, and also to the rounding of the top corner next to the eye. The sight should be wide, with square, clean-cut top corners. The sides should be beveled toward the muzzle, and the face next to the eye should have the top incline toward the eye at an angle of about 10° from the perpendicular. The face will then look black instead of gray, and the defining edge at the top will be sharp. The wide top, with its sharp edge, allows the bull to be brought to the top edge of the blade, and to be easily centered between the top corners. Another advantage is that canting can be corrected.

[The Principles of Rifle Sighting Simply Explained. By A. G. Banks. *Arms and the Man,* Oct. 7, '15. 1500 words. Diagrams.]

[An elementary explanation of the relation between the fall of a bullet, due to gravity, and the depression of the breech necessary to compensate this fall so as to make the bullet reach a given target.]

[Editorial. *Army and Navy Jour.* Oct 16, '15. 200 words.]

Troops on the Mexican border find fault with the battle sight, set for a range of 530 yards. At 200 yards, the battle sight throws the bullet 28 inches above the target. In thick country, the range represented by the battle sight is too long. It is thought that it should be reduced to 300 yards.

[Note. *Army & Navy Jour.,* Nov. 6, '15. 50 words.]

The battle sight is to be tested at the School of Musketry to determine if it should be changed.

[The Battle Sight Again. By E. Newitt. *Arms and the Man,* Nov. 11, '15. 1000 words.]

There seems to be a very general misconception concerning the theory and use of fixed elevation sights. The war rifle must be sighted in such a way as to dispense with the two impossible conditions of estimating distance and correctly adjusting elevations. If, in the case of the Springfield battle sight, aim be taken at the lowest extremity of any object more than 32 inches high, the object will be hit somewhere above this extremity at any point of the range of the bullet. In other words, a man less than 550 yards off will be hit, whether he be standing or kneeling. Lying down, he shows 16 inches above ground; hence in this case, aim 16 inches below him. He will be hit throughout that portion of the trajectory in which the bullet rises over 16 inches, *i. e.,* anywhere between 90 and 500 yards from the point of fire. The sight would be improved by an aperture mounted on the rifle so as to be as near the eye as possible.

—Arms—Rifle—Sling

[Use of the Gun Sling in Action. By E. M. Robison, Captain, 1st Arizona Infantry. *U. S. Infantry Jour.,* May-June, '15. 400 words.]

The use of the gun sling should be made compulsory for all extended order drills.

1. Its use would cause rifle to be held horizontally, since it is difficult to fire much above the horizontal with sling attached.

2. The sling gives greater rigidity, and, consequently, better markmanship. The best riflemen use the sling, and if they are aided by it, the average man will receive a relatively greater benefit.

3. Its use would prevent loss of rifle in case of panic. A panic, even though eventually controlled, would probably find most men with no rifles, and therefore worse than useless.

It is believed that the above points are worthy of discussion.

[Use of the Gun Sling in Action. A Reply by J. O. K. *Infantry Jour.* Sept.-Oct., '15. 200 words.]

The theory advocated in May-June *Infanty Journal* for using gun sling attached to left arm in extended order drills and actual combat is impracticable because it hinders lying down and rising; because the position of rifle makes running difficult and tiresome; because it makes fixing bayonets difficult, especially in prone position; because it impedes free movement in bayonet exercise; and, finally, because it produces a tendency to shoot low in rapid fire. Other points claimed are not admitted to be correct.

—Arms—Rifle—Use of in European War

[Seven Types of Rifle now in Use in the Field. *Sphere,* July 24, '15. 2000 words. Illus.]

1. The German Mauser can fire forty-five

shots a minute; it is the 1898 model, weighs 9 lbs. 14 oz. with bayonet fixed, and is sighted from 219 to 2,187 yards. It cannot be used as a single loader.

2. The Austrian Mannlicher is fast in action, but throws a strain on the wrist in operation; it weighs 8 lbs. 5 oz., being the lighest in use, while the bullet is the heaviest, 244 grains. The Mannlicher is sighted from 410 to 2,132 yards.

3. The British Lee-Enfield (Mark III) is suitable for both mounted and dismounted troops; it is sighted from 200 to 2800 yards; the magazine holds ten cartridges in two chargers, and can be loaded in two motions; a cut-off enables it to be used as a single loader.

4. The French Lebel, of the 1886-93 model weighs, without bayonet, 9 lbs. 3½ oz.; the tube magazine under the barrel carries eight cartridges, but takes longer to charge than other types and is slower in action; it is sighted from 273 to 2,187 yards; and the bullet weighs 198 grains.

5. The Belgian Mauser is the 1889 model, weighing a trifle over 8 lbs. and is sighted from 547 to 2187 yards; the magazine holds five cartridges carried in a clip; it cannot be used as a single loader; and its length, including a short, flat bayonet, is 4 ft. 11¾ in.

6. The "3 line" Nagant rifle of Russia is longer and heavier than the British rifle (exact weight not specified—Ed.); it has a triangular bayonet which always remains fixed; the magazine holds five cartridges and can discharge twenty-four per minute; it has an "interruptor," whose function is to prevent jamming of cartridges.

7. The Italian Mannlicher-Carcano is the 1891 model; it weighs 8 lbs. 6 oz. without bayonet, and measures 50¾ in.; the box magazine, under the receiver, without cut-off, holds six cartridges and is capable of discharging fifteen rounds a minute.

[The European Infantryman's Rifle. By E. C. Crossman. *Scien. Amer.* Ma 1, 1915. 2000 words, illus.]

The British are worst off in their small arms, having both the short and long Lee Enfield in service and two varieties of ammunition giving different velocities. A new experimental rifle had been finished, but was not beyond the experimental stage. The Canadians use the Ross rifle, using the same ammunition as the Lee Enfield. The French Lebel is the only rifle not loading with a clip. It has a tubular magazine like the Winchester and a very long bayonet. The Russians have a modified Mauser, firing blunt-nosed bullets of low velocity. The Russian bayonet is practically permanently fixed, and is always carried attached to the rifle.

The Germans use the latest tyne of Mauser, with initial velocity over 2900 f.s. It is the best weapon of all, and is the model from which our Springfield was taken. The Austrians use the Mannlicher, differing from the Mauser mainly in being a straight pull instead of turn bolt. The Japanese use a slightly modified Mauser. The weight of ammunition is an imoortant factor; 350 rounds weighs from 17½ to 21 lbs.

To sum up: All nations use sharp pointed bullets except Russia and England (territorials); all use attachable bayonets except Russia; all use clip loaders except France; all use practically caliber 30 except Japan (cal., 25.)

The initial velocities are approximately 2900 in Germany, Austria and Japan; 2400 in England (regulars) and France; and 2000 in England (territorials) and Russia.

[The Weapons of the Allies and their Opponents. *Army & Navy Gazette*, Aug. 21, 1915. 2000 words.]

(Note. A good description, quoted in full.)

"The present war offers a unique opportunity for the study and comparison of the various rifles, ammunition, and machine guns in use by the belligerents.

"Never in the previous history of the world has such a diversity of weapons been employed in the field. On the one hand, we have the large bore rifle, the Martini-Henry, in the hands of some of the Turkish troops in the Dardanelles, contrasting with the Italian Mannlicher Carcano with a calibre of .256in., with which they oppose the Austrian Mannlicher of .315in. The reports on the suitability, strength, rapidity of fire, accuracy and wounding power, at the various ranges of these rifles and their ammunition, that will undoubtedly be collected and published at the close of hostilities should be of immense interest and value.

"It is therefore as an introduction to the study of these reports that the following brief description of the various types in use is here inserted.

"With the exception of France, all nations are using magazine rifles, that is to say, rifles with a magazine under the bolt way for containing the cartridges. France has a repeating rifle—a tube being fitted in the rifle under the barrel, the cartridge being fed on to the platform or carrier by a spiral spring and plunger; the advancing bolt carries the cartridge into the chamber. As mentioned above, the Turkish troops are, in part, armed with the Martini-Henry rifle, a single-loader, but their main weapon is the Mauser rifle.

"With the exception of Austria, who uses a straight pull action, the rifles of all the magazine rifles are fitted with a bolt, with a turn down movement to lock the action and close the breech.

"The cartridges are fed into the magazine by means of a charger or clip.

"If a charger is employed, the cartridges are swept into the magazine out of the charger, which is then thrown away. If a clip system is arranged, the clip and cartridges are inserted bodily into the magazine, the clip falling through a hole cut in the base of the magazine when all the cartridges have been expended. "With the exception of the Russian Army, who use a quadrilateral bayonet, all the belligerents use sword bayonets.

"For a fuller description of these systems and a comparative statement of their advantages we would refer our readers to a series of

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articles on Modern Military Rifles which commenced in the ARMY AND NAVY GAZETTE of Jan. 21, 1911.

"Names of the rifles employed by the belligerents: Austria, Mannlicher; Italy, Mannlicher Carcano; Belgium, Germany, Turkey, Mauser; Canada, Ross; France, Lebel; Russia, 3-Line or Nagant; Great Britain, Short Magazine Lee-Enfield.

"The Austrian Mannlicher is a straight pull bolt action rifle of .315in. calibre. Like all Mannlicher rifles it is loaded by means of a clip, in this case containing five cartridges. It is provided with a safety bolt but no cut-off. Its weight is 8 lb. 5½ oz. The bayonet weighs 10½ oz., is double-edged near the point. With the bayonet fixed the rifle is 4 ft. 11 in., without the bayonet 4 ft. 2 in long. There are four grooves with a twist of one turn in thirty-one calibres. The sight is a 'tangent' type, and is graduated from 410 to 2,132 yds. The cartridge, which is 3 in. long and weighs 455 grains, is rimmed. The steel coated bullet has an ogival point and weighs 244 grains. The charge consists of 42.44 grains of nitro-cellulose, which gives a muzzle velocity of 2,034 f. s.

"The Belgian Mauser is a magazine rifle of .301 calibre, fitted with a detachable vertical box under the boltway containing five cartridges; it is loaded by means of a charger. A safety bolt is provided, but no cut-off. The weight of the rifle is 8 lb. 3 oz. without bayonet, 9 lb. 9 oz. with bayonet fixed. It is 4 ft. 11¼ in. long with bayonet fixed, 4 ft. 2¼ in. without bayonet. There are four grooves with a turn of 1 in 32½ calibres. The tangent pattern of sight is graduated from 547 to 2,187 yds. The rimless cartridge is 3 in. long and weighs 441 grains. The ogival-headed bullet, with a cupro-nickel sheath, weighs 219 grains. The muzzle velcity of 2,034 f. s. is obtained with a charge of 37 grains of nitro-glycerine and nitro-cellulose.

"Great Britain has armed her troops with the short magazine Lee-Enfield rifle of .303 in calibre. The cartridges are contained in a detachable vertical box, into which they are loaded by means of a charger holding five cartridges. The rifle is provided with a safety bolt and cut-off. Its length and weight without bayonet fixed is 3 ft. 8½ in. and 8 lb. 10½ oz., with bayonet fixed 5 ft. 2 in. and 9 lb. 10½ oz. There are five grooves with a twist of 1 turn in 33 calibres. The sighting is radial (that is to say, the sight stem, pivoted at its front end, rests on a bed at all distances; it is not raised to a vertical position as in the 'tangent' type) graduated from 200-2,000 yds. A system of long range sights is also fitted to the rifle, graduated from 1,600-2,800 yds. The cartridge is 3.05 in. in length, weighing 381 grains, it is furnished with a rim. The 174 grain pointed bullet is covered with an envelope of cupro-nickel. The 'cordite' charge weighs 38 grains, giving a muzzle velocity of 2,450 f. s.

"Canada uses the Ross rifle with a calibre of .300 in. The cartridges are loaded by hand into a magazine which takes the form of a fixed vertical box with a platform that can be depressed by a lever. A cut-off and safety bolt is provided. The rifle weighs 9 lb., the bayonet 1 lb. The rifle with bayonet unfixed is 4 ft. 4 in., with bayonet fixed 4 ft. 11 in. long. There are four grooves with a twist of 1 turn in 33 calibres. A tangent system of sighting is employed, graduated from 100-2,200 yds. The cartridge with a length of 3.05 in. weighs 415 grains, and is provided with a rim. The pointed bullet of 200 grains has a nickel envelope. The nitro-cellulose charge gives a muzzle velocity of 2,300 f. s.

"The French Lebel rifle exhibits a type which must be considered somewhat out of date, namely, a repeating rifle in which eight cartridges are contained in a tube under the barrel. The calibre is .315 in. The cartridges are loaded into the tube by hand, one at a time. It is provided with a safety bolt, but no cut-off. The rifle weighs 9 lb. 3½ oz., and is 4 ft. 11 in. with the bayonet fixed. Four grooves are provided, with a twist of 1 in 30 calibres. The sighting consists of a 'tangent' lever backsight, graduated from 273 to 2,187 yds. The cartridge is 2.95 in. long, weighs 415 grains, and is provided with a rim. A cigar-shaped bullet with a pointed nose, made of cupro-zinc, weighs 198 grains. A muzzle velocity of 2.300 f. s. is obtained, with a charge of 42.50 grains of nitro-cellulose.

"Germany possesses a Mauser rifle of .311 in. calibre. The magazine consists of a vertical fixed box situated under the bolt way—the bottom of the box is flush with the stock of the rifle. The magazine holds five cartridges, which are loaded by means of a charger into the magazine. This charger is of the 'lame' pattern, and weighs 109 grains, being the lightest in use with the exception of the Belgian, a material advantage. It is provided with a safety bolt, but no cut-off. Its weight is 9 lb., and the bayonet weighs 14 oz. It is 4 ft. 1½ in. long without the bayonet and 5 ft. 9¾ in. with fixed bayonet. There are four grooves making one turn in 30.2 caibres. The radial pattern sight is very strong, but projects to an undesirable degree from the rifle. It is sighted from 219 to 2,187 yds. The rimless cartridge is 3.18 in. long and weighs 369 grains. A cupro-nickel-covered pointed bullet weighing 155 grains attains a muzzle velocity of 2,980 ft. per second. The propellant is nitro-cellulose.

"Italy is armed with the Mannlicher Carcano rifle, the magazine being a fixed vertical box; it is a clip loader, the clip holding six cartridges. It is fitted with a safety bolt, but no cut-off. It weighs 8 lb. 6¾ oz. without the bayonet and 9 lb. 3 oz. with bayonet. The length of the rifle without bayonet is 4 ft. 2¾ in., with bayonet 5 ft. 2¼ in. Its calibre is .256 in., the smallest in use in the field. Four grooves are provided with a twist of 1 in 32.2 calibres. A tangent sight is graduated from 656 to 2,187 yds. The rimless cartridge is 3 in. long and weighs 331.8 grains. A round-nose 163-grain bullet attains a muzzle velocity of 2,400 f. s. The charge consists of 30.09 grains of ballistite.

"Russia is armed with the '3 line' or Nagant rifle of .300 in. calibre. The magazine con-

sists of a narrow box which protrudes in an inconvenient manner beneath the rifle. It is fitted with a safety bolt, but no cut-off. The magazine holds five cartridges, which are contained in a charger. Its weight is 8 lb. 15¾ oz. without bayonet, 9 lb. 11¼ oz. with bayonet. Its length without bayonet is 4 ft. 4 in., with bayonet fixed 5 ft. 9 in. The bayonet is quadrilateral in shape, and is always carried fixed. There are four grooves with a twist of 1 turn in 31.6 calibres. A tangent sight is fitted to the rifle graduated from 310 to 2096 yds. The 'rim' cartridge is 3 in. long and weighs 347 grains. A copper [jacketed?—Ed.] bullet with a pointed head weighs 150 grains. The muzzle velocity is 2,800 f. s. The propellant is nitro-cellulose.

"Turkey has armed the main body of her troops with a Mauser rifle of .301 calibre. The magazine is a fixed vertical box holding five cartridges; it is loaded by a charger holding the same amount of cartridges. Its weight is 9 lb. 1 oz. without bayonet, 10 lb. 8 oz. with bayonet. Its length is 4 ft. ½ in. without bayonet, 5 ft. 6½ in. with bayonet. Four grooves are provided with a twist of 1 in 33.2 calibres. A tangent sight is graduated from 273 to 2,187 yds. The cartridge weighs 416 grains, is 3.07 in. long, and is rimless. The bullet is covered with a steel, cupro-nickel sheath, weighs 211 grains, and is round nosed. The muzzle velocity is 2,070 f. s., which is obtained with a charge of 40.2 grains of nitro-cellulose. In order to compare the above characteristics with those pertaining to the whole of the principal nations in the world, the following summary is given:

"Weight.—The mean weight at the present day is 9 lb. 1 oz., whilst the weight of the rifles in 1880 was 9 lb. 10 oz.

"Length.—The mean length is 4 ft. 1½ in. without bayonet and 5 ft. 2½ in. with bayonet. Thirty years ago these figures were 4 ft. 2 in. and 6 ft. respectively.

"Chargers are used by Great Britain, S. M. L. E. and C. L. L. E. rifles; Germany, Belgium, Spain, and Turkey using some pattern of Mauser rifles; Russia, Japan, Switzerland, Portugal, and United States of America. Clips are employed by Austria, Bulgaria, Greece, who are armed with straight pull Mannlicher rifles. (Greece has also adopted the Mannlicher Shoenauer, a charger-loading rifle with a fixed vertical magazine having a rotary platform), Holland, Italy, and Roumania.

"Single or Hand Loaders.—The Lee Enfield rifles are still used by Great Britain, the French Lebel, the Portuguese Kropatschek, the American, Danish, and Norwegian Krag Jorgensen. The rifles of the following nations are provided with cut-offs:—Denmark, France, Turkey, Great Britain, United States of America.

"The rifles of all nations are provided with a safety bolt except Denmark and France.

"The calibre ranges from .256 to .315 in.

"Pull-off.—All nations employ a double pull-off to their trigger except Russia.

"The following table gives the weights:—

	1st Pull	2d Pull
U. S. America...	1½ lb.	3½ lb.
Austria	4	7
Germany	2	5
Japan	2¼	6½
Norway	1½	7½
France	2½	6
Russia	5½	Nil
Spain	2	5½
Switzerland	2½	5
Great Britain ...	3½	5

"Cartridges.—Austria, Great Britain, Denmark, Holland, France, Roumania, Portugal, Russia, U. S. America (Krag) use 'rim' cartridges. Belgium, U. S. America (short Springfield), Turkey, Switzerland, Spain, Italy, Germany use rimless cartridges. The cartridge used by Japan is semi-rimless."

—Arms—Rifle—Use of in European War—Lessons From

[The Ideal Rifle. By Lt. Col. F. F. R. Burgess, late of the Indian Army of Great Britain. *Arms and the Man*, Aug. 5, '15. 1500 words.]

The ideal military rifle should be light, well balanced, self-loading or automatic, but also capable of being worked by hand, and the magazine should hold the greatest number of cartridges possible. The caliber should not exceed .256, and, as the decisive fighting is at short ranges, the flat trajectory at long ranges may be neglected. It should have a peep sight of not less than one-eighth of an inch in diameter, and a strong, coarse bead front sight. The knife edge or barley-corn front sight is condemned.

For all-'round utility, the short and handy Lee-Enfield with its quick action and big magazine has proved itself the best of those in use in Europe.

In the trench or siege warfare on the western line through France and Belgium, there has been developed a form of attack in three stages: first comes the terrible rain of high explosive shell on the trenches to be assaulted, thus destroying everything human or constructed by human hands; then, under cover of a *tir de barrage* (curtain of fire) the infantry rushes forward into the enemy's works, the enemy being held off by the curtain, and their trenches then being converted by turning them the other way; lastly comes the terrible work of holding the captured trenches from the counter assault. Here is where the automatic rifle is valuable. The machine gun is too heavy and cumbersome, and the men carrying it forward are invariably picked off, while, on the other hand, a company armed with light automatic rifles can silence the enemy's machine guns and hold off bomb throwers making attempts to recapture the position.

The French have found that a knife is better than a bayonet at close quarters in the trenches, and a short bayonet is far better than a long one.

—Attack

See also
ATTACK

INFANTRY—Continued

—Attack—Frontal—Tactical Instruction

[Frontal Attack and Tactical Instruction. By Major S. Sciponi. *Rivista di Artiglieria e Genio,* Apr., '15. 3200 words.]

Profiting by the experience with modern artillery in the present war, the Italian Chief of Staff has issued a circular in which are clearly explained the salient points of modern combat and the tactical procedure in frontal and extended order attacks. This circular is divided into three parts: (1) rules for development of offensive action; (2) study of these rules as applied to terrain; (3) discussion of method of tactical instruction.

The rules for offensive action apply to frontal attack. There are three phases in a frontal attack, namely, the deployment, the advance, and the final assault. The analysis of the enemy's position, the distribution of forces, selection of position of battle line are important decisions. No more time than is actually necessary should be spent in reconnoitering. Prompt entrance into battle may gain more information. The infantry's formations depend on the terrain and the enemy's fire. The attacking artillery should change its position only when necessary in supporting its own infantry. The defending artillery usually discloses its position by firing on the advancing infantry. In the last stages the artillery concentrates its fire on the point chosen for the final attack. The demoralization of the enemy is accomplished by gaining superiority of fire over him. The reserves should be kept in covered positions in rear and should not be sent forward too soon. One battalion with two companies in reserve will cover a front of 400 meters. The assault should be vigorous and made by thin successive lines. The use of modern arms has given the offense the advantage of longer use of cover and a more efficient convergence of fire.

The subject of terrain is very important. On open ground the infantry advances until stopped by the defending infantry, which then becomes the target of the attacking artillery. When the infantry of the defense has been subdued the attacking infantry advances until stopped again, and so on. Covered ground is preferable for the attack, as it permits rapid developments, deception of the enemy and concentration of troops.

Tactical instruction requires that well trained troops be instructed in use of terrain and execution of frontal attacks. The idea of maneuvers is to train men in extended order formations which are the normal ones in real war. The leaders who conceive the plans are trained by study and experience while the subaltern officers and men who execute these plans are trained by drills and maneuvers on different kinds of grounds. Exercises for small commands may be executed near the barracks, while for larger commands, on account of damage to private property, the exercises are held out in the valleys or other open country.

Every regimental commander of artillery and infantry is required to make a study of this circular with the other officers of the command, insisting on mutual support of troops in battle and explaining that failure is usually due to lack of unity of action. Conferences on artillery matériel should be conducted for infantry officers by artillery officers, who should, if possible, be present at the infantry maneuvers.

See also
INFANTRY—COMBAT
TACTICS—COMBAT

—Attack—Under Artillery Fire

[Infantry Under Artillery Fire. Capt. O. L. Spaulding, Jr., 4th F. A. *Infantry Jour.* Mar., Apr., '15. 5000 words.]

For the advance of infantry under artillery fire, our Infantry Drill Regulations suggest two types of formation, the line of small columns and the column of thin lines. These are based on the nature of artillery fire, the characteristics of which include: *dispersion*, the scattering effect of a burst of shrapnel or shell in air being comparable to a shot-gun rather than a rifle; *time of adjustment*—it will probably take three or four salvos to obtain a bracket of 100 to 200 yards; *purpose*, which, though it consists primarily in the destruction of the target, may be attained by merely rendering the latter stationary and harmless; *ammunition supply*—its limitations and its replenishment.

The *line of columns* is counted upon with reason to interfere with adjustment. The different elements, working forward separately, avoiding the formation of a straight line and taking every advantage of cover, deceive the artillery commander and render observation difficult. This formation, excellent in theory, must be applied with proper consideration of the *time* element, and the dispersion of artillery fire over an *area*. The irregularity of the columns may fail to accomplish its purpose, if the artillery establishes a wide bracket and searches it thoroughly. Moreover, if the fire is oblique, the carefully staggered columns may appear simply as a deep, irregular mass. Thus it appears that the details of the deployment are often of little consequence, if only the formation cover plenty of ground. Particularly is this true when infantry is under aeroplane observation; the aerial observer will not be deceived by the small column formation, and the troops must trust for their security rather to the difficulty of adjusting the artillery fire by the aid of the necessarily few and brief signals from the aviators.

The *column of thin lines* takes advantage of the limitations on the ammunition supply by presenting only insignificant targets. Its use will succeed, if time is available for the necessarily slower advance. This method must be used understandingly, with precautions against the dangers of loss of control, and of mixing different units. Methods of attack similar to this formation have been observed in the Russo-Japanese War, and among the forces of semi-civilized nations. While the employment of the thin line principle may permit the advance of a firing line without exposing a single unfavorable target, the artillery may often take advantage of the delay to locate the newly

established line, and be in a position to dispute any further advance all the more effectively. In this connection, a remark attributed to General Von Heeringen is of interest, to the effect that infantry in the present war, in order to avoid artillery fire, have formed the habit of retiring their trenches more than hitherto; relying upon a defensive field of fire as narrow as 100 yards, they go back even behind the crest of a hill, to get out of sight.

To sum up, infantry can advance under artillery fire only by paying the price. With the aid of skilful formations, however, it may minimize this cost, and choose the coin—men or time—in which it shall be paid. On open ground, with time not vitally important, successive thin lines will postpone the commencement of serious losses; with cover, small columns well led may accomplish the same purpose. In general, the requisites for a successful advance are: the support of friendly artillery, thorough reconnaissance to disclose cover, suitable formations to minimize the loss of lives or hours.

—Combat

[Orders for Combat. *Revista Militar, Argentina.* Apr, '15. 5550 words.]

Par. 274 of our Infantry Drill Regulations begins thus:

"No scheme can be laid down for conducting a combat; neither can combat orders be drawn up according to systematic formulæ."

Every order being the consequence of a decision, may take as many forms as there are proper solutions to the problem.

An order should comprise no more than is needed by the subordinate to attain, by his own initiative, the end in view and should be drawn up with consideration for the intellectual capacity of the recipient and even for his personal characteristics.

It is not sufficient that an order should translate clearly and concretely the intention of the superior; it must animate the resolution of the subordinate by an expression of the energetic will of the chief. Victory is imposed by energy, and the energy of the leader should be reflected in his orders for combat.

The order of Kuroki at Mukden and that of Oyama at Liao-Yang contrast sharply, in their clearness and energy, with the vacillating and equivocal orders of some of the Russian leaders.

The following order of General Joffre, intended rather to reach the heart of his troops than to prescribe the technique of their attack, breathes the indomitable spirit of the leader:

September 6, 9:00 a. m.

"At the moment when there is about to begin a battle upon which the salvation of the country depends, it is important to remind all that it is not the moment to look back.

All effort should be directed towards attacking and throwing back the enemy.

A body of troops that can no longer advance must, at any cost, hold the ground they have gained and be killed on the spot rather than fall back.

In the present circumstances, no weakness can be tolerated.

JOFFRE.

Order to be communicated to all, including the enlisted men."

"As a general rule," continues Par. 274, Infantry Drill Regulations, "the first thing that should be done is to despatch rapidly the troops in the desired direction by means of verbal orders. The ultimate dispositions come afterwards."

Another paragraph of the regulations states, however, that orders to brigades and larger units should be written.

The verbal order is liable to arrive in garbled form. Example: The colonel of a regiment was to report at a certain place for instructions. The officer, who carried this order verbally, repeated it before starting out. But, instead of telling the colonel that he *only* was to report, the messenger told him that he was to report *with his regiment.*

[Regulations for Combat. By Maj. F. Nucci, 58th Infantry. *Riv. Mil. Italiana,* Apr.-May, '15. 11,000 words.]

In tactics, as in strategy, the enemy is the unknown quantity in the problem. The application of rules must vary according to the terrain and the forces engaged, but there must be some standard rules for conducting combat, particularly for the guidance of young officers. Tactical capacity must be developed by extensive practice in terrain exercises.

The new regulations for combat, No. 132, with the previous general regulations for the employment of large units in war, form a complete treatise on the application of the military art. The aim is to produce on the battlefield unity of thought and action, cooperation and harmony of different arms, without undue restriction of initiative and freedom of action. The end always kept in view is final victory.

To-day war is made by human motors, operating a great and delicate machine, the army. The moral element is the determining factor in war, and the faith of the men in their leader is the only force that will carry them through situations so perilous as to render them incapable of thought.

The infantry is the principal arm, and it must be assisted in its task by the other arms. Infantry cannot win a battle without artillery. The object of infantry is to reach the enemy at the moment of assault with all available troops in the best possible condition of physique and morale.

The battalion is the most important unit. Exact grouping into brigades is not important. The number of battalions combined under one head depends on the circumstances of the combat.

The principles of co-operation require that a commander must overcome the natural tendency to think only of his own troops and to fight an isolated action. One of the great virtues displayed by the Japanese in their last war was that one body of troops did not seek to distinguish itself at the expense of other bodies.

INFANTRY—Continued

Each body of troops must have its task. Battles are lost by allowing troops to remain inactive on account of lack of orders.

The formation of infantry for advance under fire depends on the completeness of the information concerning the enemy. If information is scanty, the line must have ample strength in the direction of its depth, in order that it may be prepared for unexpected developments. Experiments have been made to determine the vulnerability of infantry in different formations at different ranges.

The regular soldier should have the disposition to close in upon the enemy spontaneously. But the mass of an army in Europe must consist of men recalled to the colors, and their steadiness under fire will depend upon their training, education, and national characteristics.

Infantry may approach the enemy in close formation to within 3000 m. If the hostile artillery fire is effective, the advance from 3000 to 1000 m. must be by units separated by large intervals. Further advance must be in a deployed line in accordance with the principles of attack.

Each commander must keep himself oriented at all times and must keep in touch with the neighboring units. He must not allow himself to become so absorbed in the action as to lose his connection with the rest of the line, thereby exposing himself and others to danger of disaster.

The regulations for attack cover in detail the various features, such as density of line, intensity of fire, deployment, advance by rushes, rests, cover, ammunition supply, reinforcements, support of artillery, advance against hostile artillery, use of machine guns, and the assault. The attack is not an end in itself; it should have as its logical sequel the pursuit. If the attack lacks vigor and becomes weak and vacillating, the troops after a few rushes will glue themselves to the ground, and no human force will be able to move them. Commands are ineffective at close range and the soldiers are guided by the example of their leader. To-day in Poland with the Russians and Germans the struggle brings out the primitive instincts, in which racial fiber, warlike spirit, and love of country come into play, producing results of heroism that seem miraculous.

The defensive is inferior to the offensive. The basic principle of the defensive is to forestall the enemy by selecting and preparing the ground before his appearance. The position should be occupied by a series of lines, manned by a force sufficient to prevent maneuvering by the enemy. An example on a large scale is seen in France. Machine guns and field fortifications play a large part.

The proper role of cavalry in combat is mounted action. It is at a disadvantage fighting on foot, and if forced to this course by circumstances, it should resume the saddle at the first opportunity. Its action should be offensive, carried out with boldness and vigor. The combined frontal and flank attack has the largest chance of success.

The regulations recognize the value of cyclist troops for reconnaissance work, for occupying advanced positions, for pursuit, for protecting a retreat, and for menacing the enemy's flanks. These troops are essentially good infantry having celerity of movement. They are of small use in a mountainous country.

Machine guns with infantry are regarded as a reserve of fire, to be used among the troops or near them, when necessary. For cavalry, machine guns are important aids, but must not be allowed to divert it from its characteristic shock action. The moral effect of machine guns is one of their most important features. After inflicting a loss of 800 on a Russian battalion in a few minutes with machine guns, the Japanese were able to send the Russians to cover in their trenches by a display of these guns.

The classic role of artillery, to pave the way for the infantry attack, remained unchallenged till the Boer War, when the Boers stayed in their trenches during the bombardment and then inflicted heavy losses on the English infantry when it attacked. Rifle and cannon must act together. The plan of separate action of the different arms was tried in 1870 and resulted in severe losses to the Prussians. Both light and heavy artillery have their functions, the former to accompany the troops under all circumstances, and the latter to destroy field fortifications and reach troops hidden by folds of the ground. Field mortars are very useful for these purposes. It is an illusion to expect victory without a predominance of artillery fire. Infantry without artillery may be compared to an elegant automobile with no motor.

—Combat—Use of Cover

[Concerning Combat Fire Exercises. By Maj. J. M. Toledo. *Revista Militar, Argentine Republic,* Apr '15. 800 words.]

[Recommends individual exercises in taking given cover and observing at the same time a given objective. Also in choice of cover and in advancing from cover to cover.]

—Drill Regulations

Brazil

[The New Brazilian Infantry Drill Regulations. *Revista Militar,* Mar '15. 1400 words.]

[Dec 16, 1914, the new Brazilian Infantry Drill Regulations were published.]

The principal object of Infantry combat is to dominate the enemy by rifle fire and to break his lines, dispersing them afterwards with the bayonet. Fire action is the infantry's principal means of combat but the final decision is given by the bayonet attack.

Infantry—whose mission in battles is the most self sacrificing of all arms—must bear in mind at that critical time when the horrors of combat reach their limit that the enemy is in the same or a worse fix and thus by its self sacrifice it will see the enemy yield up the struggle.

Discipline is the life of armies; all are subject to it, from the commander in chief to the private soldier, and upon its quality depends victory.

The regulations are practically identical with the Argentine regulations, both being translated bodily from the German.

United States

[The Infantry Drill Regulations of 1911. By Col. Robert Hirst, Infantry. *U. S. Infantry Jour.* Mar.-Apr., 1915. 4000 words.]

In addressing the militia officers of Wisconsin, the above subject was chosen to make more clear certain salient principles which actuated the board responsible for the text.

In 1867, General Emory Upton's "Infantry Tactics" became our guide and continued so until 1891, a proof of their value. The Regulations of 1891 broke away from the exactness of close-order exercises. In 1904 new regulations appeared, not without faults, and in 1911 the present infantry drill regulations. The text is not so well written as might be. The book is not suitable as a guide for the government of a hurriedly organized force, as it presupposes much knowledge of the subject, is lacking in completeness and in the necessary detail.

The text is built upon the following ground principles:

1. Success in battle is the ultimate object of all military training.

2. The excellence of an organization depends upon its field efficiency; this latter depends upon thoroughness and uniformity of training of the units of the effective whole.

Certain definitions given are unnecessary. In its treatment of Combat Principles, the present regulations attempt to keep in view a few important ideas which pervade the whole text. First, the element of leadership and responsibility, pars. 250, 281, 305, etc., enhances the value of the book above that of any of the earlier regulations. The company is given definite instructions; majors are assigned responsible tasks in extended order. The new regulations have developed many very instructive field exercises. The part of the text will be of great influence in determining the character of the next regulations. For the first time we are cutting away from the conservatism and the narrowness of the past.

The second topic of importance frequently touched upon in the text is the control of fire and its effect.

Fire control, fire direction, fire discipline and fire superiority, terms frequently hazily used, are defined in the text by writers who have a sharp, clear distinction in mind when using these terms.

The fundamental principle of providing a reserve and flank protection, be the force a company or a division, is well brought out. The text merits careful intensive study, the fruits of which will be a considerable addition to tactical knowledge.

[Our Infantry Drill Regulations. By Col. C. J. Crane, 9th Infy. *Infantry Jour.*, May-June '15. 1500 words.]

The present Drill Regulations have stood the test, but in time changes must be made. There must be no changes backward. The Manual of Arms could be simplified considerably with a corresponding gain of time in instruction of recruits. The present regulations are too brief, former ones contained instruction now omitted and wrongfully so.

The duties of pivot guide in "Company right," "Platoons right" are not explained. There is no easy natural method by which to lessen the front—as would be required in street movements. There should be more variety in skirmish drill. The rally by squads, platoons and companies and the deployment as skirmishers therefrom should be incorporated. Battalion skirmish drill should be taught. There is need of this; the major must not lose control of his skirmish line until he can hold it no longer. Paragraph 570 advises a movement which neither the School of the Company nor of the Battalion authorizes us to practice. The Regulations should have fuller descriptions so as to better adapt them to raw troops; additional movements and formations should also be authorized.

[Formations for Infantry Companies to Practice. By Jens Bugge, Capt. 13th Infantry. *Infantry Jour.*, May-June, '15. 550 words.]

The following movements, the convenience and tactical worth of which have been thoroughly tested in the Philippines, are recommended for incorporation in the next Infantry Drill Regulations.

1. The formation of platoon columns from line or from column.

2. To assemble the company in line and then march off, the company being deployed, say prematurely, along a skirmish line.

—Fire

[Infantry Fire. By Major General Coco Francesco. *La Nuova Rivista di Fanteria.* Apr., '15. 4300 words.]

The theory of collective firing is based on the dispersion of the shots and especially on the vertical dispersion. This dispersion within limits is not objectionable. In an engagement it becomes excessive on account of the nervous condition of the men who fail to aim and to set their sights accurately. Collective fire has the tactical effect of depressing the morale of the enemy.

In the present war there have been numerous examples where the preparation for the assault was not thorough enough and the result was that trenches and positions have been taken and retaken several times during the day. The preparation by fire action should be such as to compel the enemy to bring all of his reserves into the line before the assault is made, otherwise the ground gained may be lost by counter-attacks.

On pages 74 and 75 of the Italian Firing Regulations is found a table of vulnerability. The figures in the table were got from experiments with fifty men who were good average shots. They fired six shots per minute kneeling in skirmish line and had good light and good ground. As the condition of light and terrain would be less favorable in actual combat and the men would fire more rapidly we adopt a coefficient of 2-3. The places of the men wounded would not be filled imme-

INFANTRY—Continued

diately and to allow for these vacant places another coefficient of 2-3 is adopted. Very rarelv will the target be a group of men. More frequently it will be men in a skirmish line advancing in a crouching or crawling position. For this a coefficient of 1-10 is adopted. To allow for covered positions and obscurity of the targets a coefficient of ½ is adopted. The product of these four coefficients is 1-45 which we multiply into the figure taken from the vulnerability table to find the vulnerability of attacking infantry at any range. For infantry on the defense this final coefficient is 1-54. The losses of the attackers will be considerably more than those of the defense because the fire of the former will be less efficient than that of the latter.

Between 400 and 1000 meters rifle fire is efficient. The Firing Regulations prescribe that firing should not be done outside of these limits unless in exceptional cases. For ranges from 450 to 700 meters the average vulnerability is 80% and from 800 to 1000 meters it is 40%.

On account of the low vulnerability between ranges 1000 to 800 meters the advance is more important than fire action but between 700 and 450 the reverse is true. In this second zone the attackers try to force the defense to bring into action all of its reserves. The average vulnerability of 60% between 1000 and 400 meters is borne out by figures from the present war.

The present opinion is that at short ranges the advance should be continuous, with just enough fire action to keep troops calm and to depress the morale of the enemy. Long stops at short ranges should be avoided. The attack should not use violent fire action until the moment of the counter-attack, at which time machine guns on favorable ground can do great damage.

The average vulnerability of 60% between 400 and 1000 meters shows that 170 cartridges put a man out of action in that zone. It is found from figures in the present war that it takes an average of 1000 shots to put a man out of action between 400 and 1000 meters. It is possible to save 400 out of each 1000 cartridges if care is taken during night attacks and indirect fire in day-time not to use cartridges carelessly. There is a great loss of efficiency of fire due entirely to the nervous condition of the men which causes them to shoot over the heads of the enemy. These high shots do no harm and contribute to the lack of proper preparation for the assault.

In a country where the soil is very much cultivated the extent of view is limited and the operations come down to trench warfare where one side tries to wear the other out.

In the excitement of battle the men fire very rapidly and as their amount of ammunition is limited the question of replenishing their supply becomes serious. With our present rifle it takes all the ammunition carried by about six men to put one man out of action. We should seek the means of instilling into the soldier the confidence that he can put a man out of action with the ammunition that he carries in his own belt.

See also

EUROPEAN WAR—LOSSES—FROM ARTILLERY AND INFANTRY FIRE, RESPECTIVELY

—Fire—Accidents

[Small Arms Firing.—An Unusual Accident. *Artill. Monatshefte.* Feb., 1915.]

The story is told that just as a German soldier was about to fire his rifle he was struck by a blow and noticed that the chamber and bolt of his rifle were demolished. It is claimed the accident was due to a hostile bullet which entered the muzzle, traveled down the bore and exploded the cartridge in the chamber. The tale is highly improbable, because too many conditions had to be coincidently fulfilled to make the event possible. Experiments have been made of this nature, but the rifles were then only ½ meter apart. The bullet then was split up very much and part was found inside the bore. What probably happened is that by accident some foreign body became lodged in the bore, and when the rifle was fired the reported damage resulted. Another case is reported where the muzzle of a rifle was struck squarely by a French bullet. In explaining events of this nature, accurate observation and close investigation of all the facts are necessary.

—Fire—Ballistics

[The Striking Velocity and Energy of Descending Bullets. By A. Preuss. *Artill. Monatshefte.* Jan 1915. 1000 words.]

In experiments made to determine the time of flight and amount of penetration in wood of German small arms bullets when fired vertically with the bullet in the normal and in the inverted position it was found that such bullets always maintain their axis in the same position unless the trajectory is such that the point of impact is at least 5000 m. distant from the firing point, in which case the bullet will always strike point first. A study of the effect of bullets falling from a great height is of great practical value due to the danger to troops from fire directed at aircraft or from steel arrows dropped from aircraft. The striking velocity and energy are measured by the amount of penetration in wood. Bullets striking base first have a mean striking velocity of 40 m.s., and striking energy of 0.82 m.kg. (5.93 ft.-lb.) The inverted bullet striking point first has a striking velocity of from 100 to 120 ms. and striking energy of 6.68m.kg. (48.32 ft.-lbs.). Aero arrows when dropped from sufficient height have sufficient killing power, a fact which many cases in the present war have proven.

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[Ballistic Development of the Infantry Rifle. By Prof. Adolf Keller. *Kriegstech. Zeitschrift,* May-June, '15. 5000 words. 1 table, 18 illustrations.]

(Note.—The historical review of ancient weapons, as well as the mathematical discussion of certain ballistic functions of modern small arms' bullets, have been omitted in digesting this article.)

When the artillery felt the need of increased range and effectiveness, it turned to the simple expedients of increased muzzle velocities, calibers and weights of projectiles. The infantry weapon, however, has two limits which restrict any such freedom in its development. These are the question of weight and recoil. The former should not exceed 10 pounds, while a safe limit for the latter is 2 kgm. (about 7¼ ft. lbs.). However, in spite of these limitations, we have seen the small arm greatly developed in the past 20 or 30 years. This has been due directly and indirectly to the use of a bullet of superior ballistic qualities. The one great goal is a flat trajectory. All other features are more or less dependent upon this. Take, for instance, the German military rifle, mod. 1888, with its round-nosed bullet. At a range of 800 meters, its danger space in the case of a man 5 ft. 7 in. in height was only 73 meters, as against 264 meters for the rifle, mod. 1898, with the sharp-pointed bullet. The velocity in the first case was 2112 f. s., in the other, 2970 f. s.

The question now arises how this energy can be obtained without increasing the weight of the piece or the recoil. A careful study of the laws of momentum and impact will show that the kinetic energy imparted to the bullet may be increased without accompanying increase of recoil by a reduction in the weight of the bullet accompanied by an increase in its velocity.

But this is only one-half of the problem, for muzzle energy alone is not the effect sought for. The determining factor is striking energy at suitable range. Bullets of aluminum might show up favorably at points close to the muzzle, but their effectiveness would only be for a distance of a few hundred feet. Here we encounter the problem of air resistance, which may be summed up as follows: the retardation due to the resistance of the air is proportional to the specific atmospheric resistance and indirectly proportional to the mass of the bullet per unit of cross-section. These conditions have led to the sharp-pointed, steel-jacketed bullets of small caliber.

The only remaining question of vital import is now that of stability. A long bullet would naturally fulfill the condition of mass per cross-sectional area, but this form has a decided tendency to tumble or wobble in flight. The best results have been obtained with a bullet which is practically all ogive, such as the German "S" bullet. Of course, suitable rifling enters into the problem, and there must be sufficient body to the bullet to take the rifling of the gun.

Having determined the salient features of the rifle problem, the latest development has been along the lines of refinement of details. Great attention is now being given to the question of the best form. Starting with an ogival head of 2 calibers radius, it is found that this bullet encounters one-fourth the air resistance met by a cylinder. Greater radii have been found to be still more favorable, but here again enters the question of stability. The French "D" bullet follows the boat-shape at the rear end. This is theoretically correct, but for some reason the experiments along this line have not been altogether successful. A study of photographs taken of bullets in flight show that this problem should be solved along lines already known to naval architects. The amount of energy absorbed in creating air waves and eddy currents would undoubtedly be found to be enormous if it could be calculated accurately.

—Fire—Instruction and Training

[Riflemen for War. By Edward C. Crossman. *United Service Mag.*, Feb '15. 2500 words.]

There is no question as to the importance of riflemen for war. The problem England is now facing is to teach a large body of men to shoot, and lacking the range facilities for one tenth of this body, to teach them this on the drill ground as quickly as possible.

There is a difference between prize shooting on the rifle range and the kind done on the firing line. Efficiency of the Boer fire was due to the fact that the British did not fully appreciate the effect of modern rifle fire of cool men in trenches. These men were behind cover and were not exposed to return fire, were not winded from advancing, and were familiar with the distances in their front. The individual shooting of the Boers was not so wonderfully accurate as is the general belief. They, however, took approximate aim, and were an exception to the general statement that "there is on record the testimony of eye-witnesses in all the late wars that in hot fights, many of the men behind the trenches would push the rifle up on the bank, operate the bolt as fast as possible, and pull the trigger, but all this without putting the head above the level of the trench to sight or even see the enemy."

If a man is taught to simply place the rear and front sight in prolongation with the enemy every time he shoots, you have, compared with the average, a good shot for the firing line. Wind settings, proper amount of front sight, delicate trigger pull, canting, etc., may be dispensed with. If a body of men sight even approximately at the advancing enemy, you have the best that can be expected. To teach men to do this with the material at hand, limited time, and insufficient number of ranges, the drilling must be cut down to a minimum and the time spent in instruction in the rudiments of rifle shooting. Ball cartridges need not be used for the beginners. The first step with raw men is to teach them to sight a rifle and pull the trigger. Only after a month of quick sighting practice, working the bolt, and becoming absolutely familiar with the working of the rifle, should ball cartridges be issued.

Blanks may be used as a preliminary course to ball cartridges. A range is not essential. "I can testify by personal experience that * * * a dusty field with stones in it that will afford marks and automatically say where the bullets hit, any sort of mark and surroundings where the dust will show the bullet strike, is enough to teach a man proper let-off with a loaded rifle."

On a range, each man fires but a few shots.

INFANTRY—Continued

In the method of practice described, the object is not to register each shot, but to get the men used to the recoil, the noise, and to make them continue to aim at each shot as with the empty gun. This method gives more the condition of the firing line with all the men firing at once, and each man can fire more shots than on the range.

[Making a Sharpshooter. By W. W. Greener. *Arms and the Man,* June 10, '15. 5000 words.]

The raw material should be in normal condition; good markmanship depends on physical fitness. Preliminary exercise should be repeated at intervals over a considerable period. Shooting practice is essential but should not be overdone. Command of the muscles and training of the sight can be obtained without shooting, as in "trapping" practice. The principle involved is to accustom the muscles and nerves to function under the stress of exceptional circumstances: this means simply that fatigue will be deferred, will be felt after, not during the contest. The object sought is the development of sufficient strength to last through the competitions for which one may enter. Tobacco and intoxicants should be avoided: one should eat moderately and wisely, should keep well, keep busy, keep cheerful. Speeding up for rapid shooting is essential, and exercise should be had with this end in view; it should be recollected, however, that each individual has his own economic pace.

Successful marksmanship exacts automatic functioning of nerves and muscles together with the intervention of the unrecognized muscular memory of previous experiences. Mr. E. C. Crossman is quoted as saying that, in shooting, first he treats his left arm impersonally, considers it as a mere rest for the rifle. Next he concentrates his mind on the hand and thought steadiness; and lastly he thinks "patience," endeavoring to take things as easily as possible, and avoiding to make the rifle go off when it is not right. Confidence is essential to success as a shot, confidence in one's self, in ammunition and in rifle. These granted, the foundation of all good marksmanship is short range shooting. Eyesight must be carefully tended. The eyes should never be rubbed, but must be bathed, preferably in boric acid, dissolved in distilled water. Steadiness is increased by care in breathing: a good deep breath should from time to time be taken always, but before attempting to hold on the target. In actual shooting, the vagaries due to light, to contrasts of light and shade, and to weather, should be studied in advance, so as to allow for them in practice.

—Fire—Instruction and Training—Musketry

[Course of Instruction School of Musketry, Fort William McKinley, P. I. Reprint from pamphlet by Col. George W. McIver, Infantry. *Infantry Jour.* July-Aug., '15. 5200 words.]

Thirty years ago armies awakened to the necessity of training in target practice; more recently the necessity was recognized for not only teaching the individual but also for teaching the employment of fire in action. It is so much better understood that, following the lead of foreign countries who require even their general officers to attend schools of musketry, we now assemble our field officers for an observation course in musketry. There is of course for these officers no individual practice in markmanship

Since theory and practice have been so appropriately termed twin brothers working in unison, so each day's lecture is followed by a firing exercise designed to prove and confirm the theoretical principles set forth.

No new element has entered war. Fire effect has become the dominant force, however, through mechanical improvements. Infantry fire is the great destroyer. All statistics of war proclaim this supremacy, and all regulations recognize the importance of fire superiority—its effect is no less moral than actual, since psychology is an ever present factor. With troops who have been systematically trained in time of peace, one can expect steady effective fire in action. The rate of firing can be increased to a point where superiority of fire must result. Strive for the higher rate, if accuracy allows it; since to lessen the rate in order to save ammunition is criminal, as it costs lives and the ammunition is more readily replaced. The rate must be as rapid as is consistent with accurate aiming. The tendency for the past fifty years has been toward increased rates of fire in battle. Our drill regulations recommend six shots per minute at close ranges, three or four at longer ranges; the standard rates for short ranges abroad, where great attention has been paid in recent years to training in rapidity of fire, is twelve and even fifteen shots per minute. The most essential things in the musketry training of the individual soldier are accuracy and dexterity in the delivery of the most useful rate of fire. Habit is strong, and target practice is valuable to the extent to which it promotes in the soldier the habit of using aimed fire only. A high degree of skill nourishes confidence, and confidence begets morale. This result justifies any time and effort expended toward making good marksmen.

This individual skill is to be utilized for tactical purposes, through the study of fire discipline, taught by means of combat firing and field exercises. These exercises educate those who are to command. Quickness of thought leads to prompt solutions of problems apt to be encountered, and these solutions must be suggested more or less indirectly by numerous exercises in time of peace.

—Fire—Instruction and Training—Target Practice

[The Target in Target Practice. By Lieut. Robert C. Cotton, 20th Infantry. *Infantry Jour.,* Jan-Feb, '15. 1500 words. Sketches.]

The appearance of the target, upon which is concentrated the vision and bullets of the soldier, is an important feature of the training of the man who is to become a part of our reserve army.

Generally speaking, war conditions are simulated throughout our peace training. We do

not, however, simulate the color, shape, size, and appearance of the objectives which would confront us in actual service. A mound of earth, varying in size from a skirmisher's trench to a field work, will then be the objective. A hat, a head, a shoulder, or a superimposed smaller mound will most likely be the only indication of the objective. Therefore a target of neutral color in the shape of a silhouette of a trench with soldiers peeping over it, should be used in the training of the soldier so as to save precious time in mobilization camps. This target of simple construction, can be set up in groups. The divisions can be marked off about as at present, everything over being of course a miss. A single course can be given to all soldiers, and the various classifications determined therefrom. Firing should be practised at all seasons of the year to accustom soldiers to all conditions. Target practice one day per week throughout the year provided the weather conditions of the post permit, would probably instruct the short term soldier more thoroughly than present methods.

Estimation of distances under service conditions should be made part of the training. The target practice should aim at securing the fire efficiency of the unit, as this is the true measure of the fire efficiency of the whole.

[Instruction in Shooting—Theory and Practice. By Felix M. Toledo, Major, Argentine Army. *Rev. Militar* (Argentine), June, '15. 1000 words.]

The Battalion Commander should assure himself by inspection and examination that those selected as instructors are thoroughly familiar with the Firing Regulations and prepared to give uniform instruction.

Rifles should be carefully tested at the beginning of the practice season so that each soldier may know the peculiarities of his own gun and not ascribe to faulty instruction results which may be due to inaccuracies of his rifle. Pointing and aiming drill should receive much attention, but instead of trying to make the recruit comprehend the abstract idea of an imaginary line of sight, better results will be secured by teaching him to adjust the eye so that he always sees the same image of the front sight through the rear sight groove. When aiming at the target the soldier gives little thought to the imaginary line of sight and is only concerned with securing coincidence of the sights and the point to be aimed at.

A greatly enlarged front and rear sight made of wood will be found useful in this instruciton.

—Fire—Range Finding

[An Auxiliary Range Corrector Scale for Infantry. By Capt. H. E. Eames, 28th Infantry. *Infantry Jour.*, July-Aug., '15. 2800 words. Diags.]

The Bausch and Lomb Optical Company of Rochester, N. Y., have recently produced a 6x prism binocular glass fitted with a special range corrector designed by the author to correct difficulties of aiming at long range. It is also equipped with the mil scales found in U. S. Sig. Corps Glass Type EE.

An almost invisible line of heads at a long range can be best fired upon by the use of a prominent aiming point, in other words indirect fire. To determine the artificial range to be used by the men requires on the part of the officer, the true range, visibility of target in a 6x glass, and an understanding of the very simple use of the scale. In use, the graduation marking the true range is laid upon the true target. The selected aiming point will then fall opposite the sight setting to be used. If, for example, the target is a line of heads 900 yards away, the graduation 900 is laid upon the target, and the several aiming points are indicated opposite the appropriate graduation. The sky line for instance crosses the scale at 500 yards. To hit line of heads use 500 yards on sight and aim at sky line. The bottom wire of a fence in front of firers crosses the scale at the graduation marked 1800 yards. Set sight at 1800, aim at bottom wire of the fence and hit the line of heads. The entire landscape is available for aiming points and the value is recognized if one has ever attempted to point out a distant, indistinct target to one's firing line. The theory upon which corrector scale is constructed is fully demonstrated in the original article.

A rough procedure is to use the rear sight leaf of the rifle held upside down at a distance from the eye equal to the sight base of the rifle. Method is exactly as above outlined but is subject of course to inaccuracies as is self-evident.

Tests of the accuracy of the scale on the glasses were made recently. Both accuracy and simplicity were fully demonstrated. The mil is a unit of angular measure used in target and sector designation and in estimating ranges. It is approximately 3 minutes of arc whose tangent is 1—1000 of the radius, whence its value for this kind of calculation. All problems, solved mentally, are based upon three formulæ, in which R=Range in yards, W= Width or height in yards, M=Number of mils.

$$(1.)\quad R=\frac{W\times 1000}{M}$$

$$(2.)\quad W=\frac{R\times M}{1000}$$

$$(3.)\quad M=\frac{W\times 1000}{R}$$

See also

PERISCOPES—FOR TRENCH FIRING

—Fire—Rifle Shooting—Competitions and Meets

See

OLYMPIC GAMES

—Fire—Rifle Shooting—Organizations

United States

[Rifle Shooting in the United States. *Army & Navy Register.* May 1, 1915. 6500 words.]

INFANTRY—Continued

[Reprint of the reports of the President and of the Secretary of the National Rifle Association for 1914.]

The Association now has 270 civilian rifle clubs, 49 university and college clubs, 93 school clubs, 22 state associations, 80 regiments and 50 companies. A reserve of expert riflemen is impossible unless National appropriations are made for the training of volunteer marksmen, and the construction of ranges by the Government. With the exhaustion of the present supply of old Krag ammunition, the rifle club movement will come to an end, as a rifle club cannot be expected to furnish its own ammunition, and the Ordnance Department has no appropriation available for its manufacture. Rifle clubs could be organized among the fraternal organizations of the country. Those having uniform rank, with a little encouragement, would turn their local branches into rifle clubs. Work among universities and colleges has been progressive, seven new clubs having been gained and none lost. Rifle work should begin with the school; the greatest effort should be made to promote rifle shooting as a sport in the public high schools of this country. As already intimated, legislation is needed to enable the National Rifle Association to carry out its purpose.

—Instruction and Training

[Infantry Training, 1914. By Lieut. Col. W. L. Raws, Commanding 63rd Infantry. *Australian Mil. Jour.*, Apr., '15. 4500 words.]

A discussion of the 1914 British regulations. These regulations were issued August 10, 1914, six days after the outbreak of the present war and embody the principles under which the British infantry is now being trained.

The new battalion consists of headquarters, machine gun section, and four companies, each approximately 225 strong. The company commander is a major or mounted captain, with a captain as second in command. The company is divided into four platoons, each under a lieutenant, with a platoon sergeant as second in command. Platoons are numbered consecutively throughout the battalion, and are divided into four sections numbered consecutively throughout the company. The section is the normal fire unit and the efficiency of its commander is regarded as of paramount importance.

In the old eight-company battalion the command of companies often fell to inexperienced officers and the battalion commander had the choice of two evils, interference or inefficiency. The new system allows more complete supervision without weakening the responsibility of the subordinate commanders.

Close order drill is mentioned as of first importance in producing discipline, cohesion and instant obedience. Arms are sloped (brought to the shoulder) before a movement in close order is made, and, in extended order, the soldier comes to attention before moving off. At the command "Halt" the men stand fast unless ordered to dress. The lateral space occupied by men in ranks is 27 inches.

Extended order drill includes the sending of verbal messages. Reference is made to the tendency of extended order drills to cause slovenly movement and inattention, which must be corrected by frequent return to close order.

Soldiers must be taught that so long as they are physically able to fight surrender is a disgraceful act.

As cover from aircraft, woods and hedgerows are most useful; men lying down are more difficult to observe, especially if they do not look up. The sides of a road are preferable to the middle. In firing at aeroplanes aim six times the length of the machine in front.

One n. c. o. and four men in each company to be trained as scouts. Men lie down at regular halts in marching.

Company and battalion commanders in action leave messengers with the next higher commander. Initial orders on the battlefield conform to the accepted type of written orders. Throughout an action commanders must anticipate events, so as to be able to give orders promptly when occasion arises. If the training of officers is on sound and uniform lines, commanders can act upon indications when definite information is lacking.

The main essential to success in battle is to close with the enemy, cost what it may. The object of infantry in attack, therefore, is to get to close quarters as quickly as possible. Emphasis is constantly laid upon the necessity for movement; "Infantry in attack must not delay the advance or diminish the volume of fire by entrenching," "The best method of supporting a neighboring unit is to advance," etc.

Companies in the firing line should furnish their own supports, as control is facilitated by distribution in depth rather than in breadth. Reinforcements should not be sent forward in driblets, usually not less than a platoon. When direct control of fire becomes impracticable men should work in pairs. After a successful assault a portion of the troops should pursue the enemy while the remainder is re-formed. The reforming should not be upon the captured position, for fear of hostile gun fire, but on the least exposed localities in front.

Premature deployment in close country is to be avoided, and, when cover from view and the proper protection is afforded, troops should advance in close order.

For infantry in defence, emphasis is laid upon the necessity of taking the offensive as soon as possible. The maximum number of men for firing line and supports equals the number of yards of frontage. Local reserves should not reinforce the firing line but assist by local counter attacks. Low-sited trenches are preferred to high-sited and cross fire should not be too strongly relied upon.

One hundred twenty rounds of ammunition are habitually carried upon the person, to be increased to 200 before going into action. Ammunition for the firing line to be taken up by reinforcements. Entrenching tools not to be carried on pack animals, the brigade re-

serves carrying 368 picks and 568 shovels on wagons.

Positions for machine guns should be prepared in advance and the bulk of the guns held in hand out of action until required. Ranging fire should not be used when surprise is of importance. High training in semaphore and passing orders is essential. If necessary, machine guns must sacrifice themselves to cover the retirement of their infantry.

[A System of Infantry Instruction. By Major J. H. Parker, 8th Infantry. *Infantry Jour.*, May-June '15. 2000 words. Table.]

What are the duties of an infantry soldier? Is your company a homogeneous unit or is it a mixed outfit like an ungraded school? We have made progress in the last few years by running on schedules and programs but the fact remains that you cannot make a satisfactory program for a mixed company. It is true that in such a company the recruits absorb a certain amount from the old soldiers; but this one advantage is outweighed by many disadvantages.

Recruits should be assigned in larger groups, which is the first step in a system. Next make a list of all subjects necessary to an infantry soldier: Bayonet, camping, cooking, marching, drill, use of machine guns, use of pistol, rifle, etc., signaling, sobriety, etc., etc. Grade each man in each subject, and base your work upon the tabulated notes. It will give a standard for comparison at the end of a period and enable you to judge a man accurately.

The company is divided into squads, under instructors. The men rotate from squad to squad in half-hour periods. Officers visit all squads and supervise instruction, etc. The system makes for rapid progress wherever used.

Our duty in the Regular Army is really and primarily that of normal school work in its relation to national defense. It is not what we can do ourselves in actual war, but what we can do to elaborate methods to shorten the time in which we will stand alone in the first line. We have not, nor do we seem to have worked very intelligently toward, a solution. The army must become a training school for "minute men." Each regiment of infantry available now could turn out 120 men per year with 10 months' training. Furlough these men for remainder of enlistment and pay them $100 per year. It would provide a "citizen soldiery" and would soon enable us to fill up our ranks with trained men, and eventually leave a big surplus from which to organize other forces for "the first line."

See also

INFANTRY—FIRE INSTRUCTION AND TRAINING

—Instruction and Training—Company

[A Schedule for Company Instruction. By Arturo Maillard, Captain en la Escuela Militar. *Memorial del Estado Mayor del Ejército de Chile*. Mar., '15. 2500 words.]

A—Utilizing marches.

Twenty-nine different exercises are listed and commented upon, covering every kind of duty that may possibly be exacted of a company in campaign.

B—Combat.

Here are enumerated, and commented upon as instructive, thirty-five problems, involving the employment of the company alone and in battalion.

These problems and exercises have been translated from the German, and arranged in sequence, by the author.

[Company Exercises on the March. Anonymous. *Rev. Militar* (Argentine), June, '15. 600 words.]

(Outlining 21 simple exercises which may be practiced by the company while marching along the road:—Changes of formation to permit the passage of mounted troops; to cross a bridge, etc.; silent transmission of orders throughout the column; passing through a hostile village; individual exercises in estimating distances, locating targets, etc.)

—Motor Transport of

See

MOTOR TRANSPORT—OF TROOPS

—Organization

[The Evolution of the Infantry Company. By Major L. L. Durfee, 26th Infantry. *Infantry Jour.* Sept.-Oct, '15. 8200 words.]

History is full of the accounts of wars and military topics. A careful search of sources shows a dearth of accurate data concerning the infantry company. Details of military organizations have until recently received little attention. The Romans, considerably advanced in the art of writing as well as close students of war, have given much more information, though details are often singularly lacking. For instance, in all that has been written of Roman tactics and organization, from Polybius to Vegetius and Osmender, the exact structure of Caesar's legion, cohort, century, and maniple, are not given. This paucity of detail concerning the infantry company exists of subsequent periods, particularly from 1700 to 1785.

Various influences bear directly and indirectly upon the organization of this unit, such as the functions of the different arms, organization and administration, armament, tactics, military systems, and even military policy.

Historically, infantry began with the segregation of mankind into families and tribes. It was of course the first arm of military service. Organization was rudimentary. The size of the company was variable, depending upon number of available men under the chief of the tribe. Arms were the club, spear, and later the sword and the bow and arrow. Combat was personal, leadership consisted mainly in encouraging the followers by superior skill and personal prowess.

Upon completion of the expedition or emergency, the members of the tribe returned to their usual occupations. As tribes increased in number, subordinate leaders appeared. As communities increased and became stabilized, the necessity for more continuous govern-

INFANTRY—Continued

ment became apparent and military leaders assumed more authority. Forces in battle increased in size. Some organization had to exist, but no details are given. The principle of having the greatest number of men at the point of contact was understood and was secured by the use of deep formations. Body armor appeared, also mounted troops. Horsemen and charioteers are chronicled. The pike was the leading weapon, and the defeated army was often annihilated. In one form or other the pike has survived all the great changes in armament, and is today, as in the days of the cave man, the final arbiter of battle.

Heavily massed formations permitted the Romans to group large numbers under one man, and units were not clearly defined. The Spartans had an administrative and tactical unit of about 30 sworn comrades in a normal formation of eight ranks of four men each. Four such units were combined into a larger, which corresponds closely to our company of four platoons. The Macedonian phalanx of 1024 men in 16 ranks and 64 front, designated 4 files as a unit, and four such units as a larger,—comparing closely to the modern battalion of 4 companies of 250 men each. The Roman legion, 3000 men, does not compare so closely with modern infantry organization,—although the maniple with its front of 10 men and depth of 6 to 12 ranks might be considered as analogous to a company. It is clear, however, that their organization contained a unit of 200 men under a centurion.

The Romans, needing a more flexible formation for rough and uneven terrain, formed the legion into lines of small masses with intervals. They brought great changes into the armament, and perfected and used the sword more than their predecessors. The fall of the Roman Empire destroyed their military organization. A haphazard custom contemporary with the rise and fall of feudalism replaced it. During the Middle Ages, infantry lost its position, though later by means of the cross bow and the long bow of the English, archers began to slowly regain it. The firearm was invented and greatly developed.

Monarchs began to revive the custom of maintaining regular establishments. The payment of these troops and their continuity of service gave a degree of system and organization.

In England, about 1350, bands of dismounted men banded in groups of scores, hundreds, and thousands under respective chiefs. The intermediate group is in theory the present company and its captain as it existed for 600 years. In other nations, the strength varied between wide limits, and it is to-day quite different from our own.

In the sixteenth century, German companies contained 300 men, though there were many exceptions. French and Spanish companies were smaller, though larger than the normal English company of 113 men. Firearms introduced new tactics and consequently new organization. The development of infantry fire further changed tactical formations. Two standards are now clearly developed; one a company of 100 men for Great Britain, due possibly to her smaller armies; the other a company of 150 men in Prussia and Russia. Others adopted a mean strength, but this was variable, and not in general use nor so consistently maintained.

In 1900 Great Britain had companies of 106 men for home service and of 122 men for service in the colonies. Eight companies formed a battalion. Two or three active battalions formed a regiment, which was administrative only. There were from one to four territorial battalions as reserve. Brigades were composed of four battalions.

In 1898, the U. S. adopted the present battalion organization. Our companies have varied from 50 to 78 men, except as follows: For the War of 1812, 102 men; Florida War (1838) 90 men; Mexican War, 110 men; Civil War, 98 men; Spanish-American War, 106 men; Philippine Insurrection (1899) 120 men. This is a summary of 26 changes in 100 years.

About 1850, nations except Great Britain and the United States, adopted a company of 150 men at peace strength and 250 at war strength. The two exceptions made slight increases. The most recent trend is universally toward a larger company.

To resume in summary, it can be said that despite certain analogies, the modern company is distinctly a creation of modern times.

The evils of a double system are largely obviated by compulsory and universal training. Great Britain for this reason now suffers the evils attendant thereon. The United States clings also to the double standard, which has so often demonstrated its amazing folly, especially in connection with voluntary service. We are naturally led to consider the best strength and organization of the company in our army. The unit should be smaller on account of our untrained material, the amount of clerical work necessary, the psychological side of leadership. For the larger unit is the fact of economy in feeding, sheltering, etc. The division of 20,000 to 25,000 is the correct highest unit. All great nations with standing armies have adopted the standard of 250 men, but everything considered the best company organization for the United States is 150 men, subdivided into two platoons of two sections of four squads each.

—Protection for—Portable

See also
BULLETPROOF SHIELDS
HELMET—ARMORED

—Tactics

[By Major I. Tellez. *Memorial del Estado Mayor del Ejército de Chile*. Jan., 1915. Continuation from previous issues. 3000 words.]

THE OFFENSIVE

The battalion as advance guard: In the problem discussed the battalion is the advance guard of a reinforced brigade, preceding the main body at 1800 meters, with a distance from the point of the advance guard to the tail of the battalion of 2100 meters. Information is unexpectedly received of the presence of the enemy well to the front, and the battalion

commander solves his problem in light of his instructions and the situation. The terrain is described in general terms, and the action of the battalion commander is discussed. The orders issued are verbal and of the usual forms.

THE DEFENSIVE

The Occupation of a Position: The spirit of the Chilean regulations is for the offensive under all possible circumstances, though it is recognized that a defensive attitude must at times be temporarily assumed. The problem is that of guarding a flank by closing a valley through which runs a line of communication. A general statement of the terrain is given, and the deployment of the battalion, in a position of readiness, is made on the basis that 600 meters front is the proper extent to be occupied by a battalion on the defensive. A counter attack is strongly recommended, the psychological moment being just after the repulse of the enemy's principal assault.

—Tactics—Cooperation with Artillery

[The Co-operation Between the Infantry and Artillery in an Engagement. By Captain Ignazio Libertini. *La Nuova Rivista di Fanteria.* May, '15. 5700 words.]

An army is a unit so organized that its component parts work harmoniously together for the accomplishment of a certain end. Only when these component parts work together in harmony and mutually support one another can there be any hope of success. It is clear that co-operation should exist between the different branches of an army and some one must be held responsible that it does exist. At certain times this co-operation is definite and exact, as when the artillery supports the advance of the infantry. At other times it is not so intimate, as when a cavalry command marches as a flank guard on a distant parallel road.

The infantry and artillery are the real fighting forces of the army. They are called upon to stand the brunt of all the work from the first encounter to the final assault. The cavalry and engineers are sometimes called in at opportune moments to aid the infantry and artillery, but the final result will depend on the harmonious work of the latter two.

Who is to be held responsible for the establishment of this necessary co-operation? Brigade and regimental commanders should not be vested with this responsibility as the areas under their command are too restricted to permit them to tell whether or not they need the artillery troops worse than the commands immediately adjacent to them. The work of the Commander-in-Chief and of the Commander of an army is too important for them to have to establish co-operation between the infantry and artillery. It seems that the commander of a division or of an army corps is best suited to exercise the function of co-operation between these two branches. The areas covered by their commands make them preferable for that work. The strength of an army corps varies and its function will vary with its strength. The work of a division does not vary on account of a change in its strength and for this reason it is preferred that the exercise of the function of establishing co-operation between the infantry and artillery be vested in the commander of a division or of that variable command which most closely approximates the division in its composition.

The word "co-operation" is understood to mean the joint operation of the component parts for the accomplishment of some plan. In order that this co-operation be assured it is necessary that definite tasks be assigned each branch or component part of the army and that the commander of each branch be informed of the work of the other branches and also of the general plan. As different situations arise during an engagement the task assigned a certain command might have to be changed.

On account of the kind of work assigned to the infantry it should not be called upon to assist the artillery. Along the front occupied by a division the attention of the different infantry commanders is so much taken up with what is going on in their immediate fronts that they cannot go to the aid of the artillery. With the artillery the contrary is true. It is stationed in rear of its own infantry and on account of its long range can concentrate its fire anywhere along the firing line.

Should the artillery, in its work of co-operation with the infantry, be under the direction of the division or the artillery commander? It should be so used that its work at any time will be most beneficial in the execution of the present and future plans, and as these plans are usually worked out and known by the division commander it seems right that he should assign the tasks to the artillery.

In view of the foregoing the artillery and infantry should not be taught co-operation. This is a function of the division commander and should be the result of study and application. The use of the different arms will depend on the different situations that may arise. These situations are variable and therefore no fixed rules can be laid down. It is universally admitted that there should be constant communication and good understanding between superior and inferior commanders.

From the foregoing we draw the following conclusions:

1. On account of the effectiveness of modern arms, combats to-day are usually decided by fire action. Sometimes the assault with the bayonet is necessary, but this only follows after fire action has caused great losses. As the fire action of the infantry and artillery is so important in a battle it is necessary that there should be co-operation between them.

2. The infantry has to maintain its fire action and advance. In doing so it will suffer great losses. As it approaches the enemy's position the efficiency of the fire of the attacking infantry will decrease until just before the final assault when it will cease altogether. It is the duty of the infantry commanders to maintain the efficiency of the fire action as long as possible.

3. The artillery has absolute control over itself. It does not get away from the immediate control of its superior officers. It can easily concentrate its fire on any point within its range.

INFANTRY—Continued

4. On account of the special characteristics of the two arms the infantry cannot be called upon to complete the work of the artillery, but the artillery may be called upon to aid in, and complete the work of the infantry.

5. It becomes the function of the commander of a body of troops containing infantry and artillery to establish co-operation between them because he can use the artillery in such a way as to help best in carrying out the general plan.

6. It is not the function of the commander of an army corps to establish co-operation between the infantry and artillery because his attention is absorbed in the more important work of co-ordinating the work of his command.

7. A certain amount of initiative is left to the subordinate commanders in the interpretation of their orders, but it should be so exercised that the interpretation be in keeping with the general orders received.

8. When we consider the characteristics of modern combat we can readily see how important it is that there exist easy and uninterrupted communication between superior and inferior commanders. The better this communication the more easy will it be to obtain energetic and sure intervention of the different troops during battle.

9. Since the timely use of the infantry and artillery has so much influence on the result of an engagement there should be free and uninterrupted communication between the commanders of the infantry and artillery and the commander who is responsible for the co-operation of these two branches.

—Uniforms

See
Uniforms—Infantry

INDIA

—History

See also
Sikh Wars

INITIATIVE

[Initiative in War. Anonymous. *Revista Militar,* Mar '15. 4200 words.]

Since the Superior Command cannot pre-establish in orders all the eventualities of a combat, initiative is essential, but this initiative must limit itself to the means of meeting situations in harmony with the general intent of the Superior Command.

Thus opportune action is often possible only through independent resolution, guided by general instructions from the Superior Command. These instructions state *what* is to be accomplished but not *how* it is to be accomplished. There is thus left an ample field for initiative. But initiative must not only comply with orders from the superior command, it must supply what is lacking in these orders to carry out the will of the superior command under unforeseen changes in the situation.

The eagerness to assume responsibility is the greatest military quality of any soldier charged with any mission.

The time value of an order is in its *spirit* and not in its letter. There are occasions when the disobedience of the letter of an order is the most intelligent expression of obedience to its spirit.

Many historical examples illustrate this principle: The charge of the Light Brigade at Balaclava was a fatal following of the letter instead of the spirit of an order.

In brilliant contrast to this dull, futile, and blind obedience to the letter of an order was Captain Lignitz' conduct at Vionville in 1870. Sent to the headquarters of the 2d Army (3d and 9th Corps) on a mission by his Corps Commander, he there learned of the French advance on Vionville and of the plan of the Prussian Superior Command to attack Mars la Tour as soon as possible with the 9th Corps. Instead of accomplishing his mission and returning to his Corps Commander he used his initiative, gained personal information from the field of Vionville, used his position as a staff officer to get two bridges thrown across the Moselle, got in touch with the leading troops of the 9th Corps, directed them how to cross the Moselle and where to strike the enemy and informed them of the urgent need for haste—all on his own initiative and before his Corps Commander could have had time to get in touch with the vitally changed situation.

By initiative then we mean: to anticipate events by prevision and calculation, to fill in by intelligence and spontaneous insight all the vacant spots in an order, to master the intentions of Superior Command by reflection and the profound knowledge of the situation, to work and provide in every possible way for the efficient cooperation of all the elements of an army.

How difficult it is to awaken and train these precious, these inestimable qualities in an officer and how easy it is to destroy them, to annihilate them by the fatal practices of blind routine.

At the battle of Liao-Yang, Colonel Martinof with a single regiment of Infantry and a squadron of Cavalry saved the 3d Russian Army Corps from a Japanese enveloping movement by fiercely attacking without orders the Japanese flank, which he surprised and rolled back with his small force.

The Japanese enveloping movement failed because they had no local reserve for their enveloping flank.

After the battle of Mollwitz the Duke of Holstein allowed the Austrians, who had been disastrously routed, to escape without launching his own fresh troops in pursuit.—A fatal lack of initiative born of that sorry school which accustoms the subordinate to act only under the compulsion of orders.

From initiative is born the spirit of mutual support which arises, coordinating all the forces of an army and orienting them towards the great final goal: victory.

How often the lack of this initiative in 1870 transformed the probabilities of French victory into the terrible reality of rout. This mutual support, this solidarity is a factor which multiplies the impulsion of the mass,

inclining the scales of victory still more to its side. More than once in 1870 German corps' divisions, brigades, and even detachments triumphed by mutual support alone in spite of lack of preparation and staff blunders. Solidarity means co-operation, initiative, abnegation:

Cooperation—Since it unites its strength to its comrade's in facilitating the great common cause.

Initiative—Because it must supply with its own intelligence the thousand eventualities of battle to make cooperation effective.

Abnegation—Because it cannot weigh the personal sacrifice before giving the needed aid.

Solidarity means: Blücher at Waterloo instead of d'Erlon at Ligny; Werder at Woerth; Lynker at Vionville; the Crown Prince of Saxony at Beaumont instead of Castagny at Spicheren.

—In Combat

[Liberty of Decision of the Commander in the Combat—"Bayoneta." *Rev. Militar,* Argentine. May '15. 2000 words.]

Par. 273, Infantry Drill Regulations, provides that "If the decision of the superior chief is not implicitly determined by the war situation, he is at liberty to attack, defend himself, gain time or conduct the operation in any manner whatever, changing direction to avoid the enemy if he wishes."

The order should clearly express his intention. The term Superior Chief is not limited to those in high command, but includes any officer or soldier exercising a separate command. It is not the size of the command that governs, but the special functions its leader is called upon to exercise.

The occasion for the independence of action contemplated by the regulations will arise usually when contact with the enemy is so loosely established that no proper estimate of the situation can be formed. An example from the Russo-Japanese war will help to make clear the spirit of this tactical provision.

Upon the outbreak of the war Russian troops were despatched in convenient directions to cover the concentration of her main forces at Liao Yang. One of these detachments, commanded by General Zassulitch, took position along the heights on the right bank of the Yalu, more than 200 km. from Liao-Yang. It was known that the Japanese had landed in Korea and were advancing with great difficulty through that country. The mission of the detachment was to delay the advance of the Japanese as long as possible to gain time for the concentration at Liao Yang. This did not exclude the idea of attacking the enemy when conditions favored a successful issue, nor of withdrawing to new positions when threatened with defeat. In other words, while the general situation clearly imposed a defensive attitude, the commander was free at all times to carry out his mission in accordance with his best judgment by attacking, taking up a defensive position, gaining time by a delaying action, or even retiring without fighting.

Par. 309 provides that the independence of action of subaltern commanders should never degenerate into arbitrariness. The initiative restrained within proper limits is the basis of all great results in war.

Here again we may refer to the battle of the Yalu for an example.

Gen. Zassulitch, to show his contempt for the Japanese, ordered his troops to resist in the positions they occupied; they were surrounded by superior forces and compelled to cut their way out with the bayonet, losing 22 pieces of artillery and all their machine guns. This arbitrary decision of the commander compromised the further execution of his mission and left the way open to the Japanese for a rapid approach to Liao Yang.

INTERNATIONAL LAW

See

European war—Relations with United States
Internment
Neutrality—Violation of
Peace propaganda

INTERNMENT

See also

Mexico—Internment of Mexican troops by U. S. (1914)

ITALY

[Italy. *Información Militar del Extranjero,* (Madrid). June, 1915. 4000 words.]

(A short account of the origin and distribution of the Italian people, the present political limits, including colonies and protectorates, the organization of the government, commercial development, and military resources.)

—Aeronautics

See

Aeronautics—Italy

—Aeronautics—Dirigibles

See

Dirigibles—Italy

—Army

[The Italian Army. Anonymous. *Sphere,* May 22, '15. 320 words. Illus.]

Cavalry.—Each corps has a cavalry division. A regiment of cavalry is composed of five squadrons. The men are excellently mounted. Government breeding establishments furnish the heavy horses, Sardinia the light horses.

Scouting and patrolling are well done. Dismounted work is seldom practised, partly because two battalions of Bersaglieri cyclists are attached to each cavalry division. They do no scouting, but are expected to do most of the dismounted work. Italian cavalry officers ride remarkably well.

Infantry.—Italian infantry formations have undergone modification as a result of the war in Tripoli, though the organization remains practically unchanged. An infantry brigade comprises two regiments, each of three battalions of four double companies.

The infantry equipment is excellent. The pack weighs about 30 lbs., and includes a portion of a shelter tent. The uniform is of gray-green, the "Alpini" and "Bersaglieri" wearing a darker shade. Discipline and marching

ITALY—Continued

power have improved greatly as a result of the late war.

[Military Force of Italy. *Revista de Artilharia.* Aug, '15. 800 words.]

When war began, Italy was in an extraordinarily difficult position to effect mobilization. One third of all her regiments were in Libya. A large number of ships of the navy were in drydock. The army was undergoing a period of reorganization, and the artillery was being supplied with new material. The aero corps needed reforming. Serious faults had to be overcome in the territorial forces. Parliament was backward about appropriating money.

The lack of preparation for war occupied the government. The political situation brought about by the world war was tense. The government finally provided liberally, and all attention was devoted to getting troops and materials ready. The minimum number of men for the army was fixed at 1,000,000 men, and provision made for as many more as might be required. In April of the present year, the active forces of the army consisted of 600,000 men, while in 1914 it had consisted of 14,121 officers and 250,000 men. The territorial militia was built up to 450,000. Having reached this favorable military situation, Italy severed relations and engaged in war with her ancient ally,—Austria-Hungary.

The order of mobilization of the 23rd of May called the 1st reserve militia up to the year 1883, and the territorial militia, second reserve, up to the year of 1876, including those to the age of 39.

The approximate war strength of the Italian army is 3,400,000. In time of peace, the army consists of twelve army corps and three divisions of cavalry. Each corps of the army has 24 field batteries. The number of mountain batteries for the army is fixed at 46.

See also

PIANELL, GEN. SALVATORE

—Army—Artillery

[The Italian Artillery. Editorial. *Artill. Monatshefte,* June, '15. 1100 words.]

Italy completed its rearmament with Deport guns shortly before the opening of the war. Of the light batteries, half are armed with the Deport gun and the other half with the Krupp gun, model 1906. Both fire the same ammunition and are the same ballistically. It is doubtful whether the aiming and pointing device of the Deport gun, especially for combating aero-targets, has been perfected. Italy has no light howitzers. The field artillery consists of the following.

200 light batteries	=1160 guns
27 mountain batteries	= 162 guns
14 heavy howitzer batteries..	= 56 guns
6 heavy gun batteries.......	= 24 guns
Total	=1402 guns

The fortress artillery is armed with 9, 12, and 15 cm. guns, 15 and 21 cm. howitzers, 9, 15 and 21 cm. mortars. The coast artillery is armed with 24, 32, 40 and 45 cm. guns, 24 and 28 cm. howitzers.

See

FIELD ARTILLERY—ITALY

—Army—Cavalry

See

CAVALRY—ITALY

—Army—Organization

[The Reorganization of the Military Forces of Italy. *Militär Wochenblatt,* num. 69. 1000 words.]

[Note: This article was written before the declaration of war by Italy—Ed.]

The intense activity in Italy since the outbreak of the European war has rehabilitated the military strength of the country. Not only has neutrality been preserved, but a reform in military matters such as the most ardent patriot had not dreamed of has been effected. Obstacles before apparently insurmountable have fallen like houses of cards. Pressure of circumstances has overthrown opposition to the increase of military forces and the lack of finances has disappeared as if by magic.

General Zuppelli, the present Minister of War, is a man who has known how to reanimate the *esprit* of the army, and General Cadorna, the Chief of the General Staff, has subordinated himself completely to the plans of the minister, recognizing in the latter the future generalissimo of the army. Thus the supreme command in time of war, always a knotty problem, has been solved in a manner eminently satisfactory.

The prestige of General Cadorna has been so great that, on the death of General Pollio, two weeks after the outbreak of the European war, Cadorna's influence was instrumental in securing the appointment of Zupelli to succeed him as Minister of War, thus securing to the country an eminent man whose plans could be adopted unhesitatingly by the General Staff.

The principal effort of the reformists was to obtain a total of a million effectives in the active army, and to this end, to create the necessary bodies of officers and non-commissioned officers. Several contingents have been called to the colors, and the term of service of others has been prolonged.

The first line troops now actually number about 600,000 (April—Ed.), divided into twelve army corps and three cavalry divisions. Another call will provide for twelve more divisions and special troops, with a total of 250,000 men, leaving available 450,000 reserves.

A law was passed providing for the reserve officers and their instruction. The officers were to be taken in part from the active army, and an early call for this force was not considered advisable, inasmuch as these officers needed to be in the ranks for five or six months prior to the call, and, besides, the Alps being covered with snow during the winter, it was hardly possible that serious operations could be undertaken then. Later numerous officers were appointed from this source, and the call issued.

With the call have been issued also instructions for the organization of courses of instruction throughout the country for candidates for commissions. These courses were to begin the first of May and to last four months for officers of the Alpine troops, Infantry and Engineers. Enlisted men might apply for entrance to these schools after three months of service and a certain specified amount of instruction.

An increase is also contemplated in the officers of the supply departments, and a law was framed providing for this increase, the officers to become captains after three years of service.

The field artillery received an increase of three batteries in each of two regiments of heavy artillery, a new mountain regiment of twelve batteries was organized, and the light field artillery so increased that each army corps is provided with twenty-four batteries in place of sixteen. The increase in the number of batteries was partially provided for by the change in the number of guns from six to four in each battery.

The aeronautic arm also received attention, the old organization being remodeled and large additions provided.

The military defense law was unanimously passed, although it adds greatly to the tax burdens, and is detrimental to business interests. The Minister of the Interior and the Minister of Justice worked in co-operation with the Minister of War in the framing of the law.

It is of course understood that a naval power like Italy cannot neglect her fleet in these momentous times in Europe, but has looked to its efficiency as well as that of the army, and with augmented military and naval forces in position to act decisively either in the war or in the peace negotiations afterwards.

[Italy on a War Footing. Anonymous. *Scientific American*, June 19, '15. 1500 words. Illus.]

Liability for military service in Italy includes nine years in the active army and the reserve (which includes 2 or 3 years with the colors), four years in the mobile militia, and six years in the Territorial militia. The field army at the present time should aggregate a little over 1,000,000 men. The army consists of 14 corps, with various units in reserve.

There are four armies in the field, each consisting of two to four corps and one cavalry division. A corps comprises 25,000 or 37,000 men with 104, or 134 guns, depending upon whether or not an extra mobile militia division is attached.

Due to geographical and topographical considerations, the greater part of the army is permanently stationed within reach of the French and Austrian frontiers.

The infantry weapon is a box magazine Mannlicher-Carcano rifle weighing 8 lbs. 6 oz., caliber .256, initial velocity 2395 f. s., danger space 750 yards. The artillery has been armed with the Deport 75 mm. gun with some improvements. A part of the Italian army are veterans of the war with Turkey. The Alpine troops and the Bersaglieri (sharpshooters) are picturesque elements of the army.

[Foreign Notes. Italy. Army and Navy. *Mem. de Artill.* (Spain), June, '15.]

The law of June 30, 1910 reduced the period of active service to two years and the total period of military liability to nineteen. After the two years in the standing army, six years of service are required in the reserve of the standing army, four in the mobile militia, and seven in the territorial militia. The annual contingent is divided into three categories: the first is analogous to our quota for the ranks, the second to our quota for instruction, and the third consists of those excused from service and who in case of war would assist in garrison service.

The kingdom of Italy, with an area of 286,682 sq. km. and a population of 34,500,000, had an effective peace strength in 1913, not including African troops, of 15,000 officers and 290,000 enlisted men, including 30,000 carabineros, and 64,300 horses and mules. On a war footing, it is supposed that the twelve army corps, three cavalry divisions and various independent troops, would contain 600,000 effectives for the first line, with an effective strength of 250,000 troops in twelve reserve divisions and various other units for the second line, and with 450,000 additional territorials.

The last reorganization of the Italian army was under the law of July 17, 1910, which was characterized by the creation of high commands, the reorganization and increase of the artillery, and the reduction of the auxiliary services. Four permanent army commands were created, thus providing for the formation of an equal number of large units in case of war. Inferior commands were provided as follows: 12 army corps, 25 divisions and 3 divisions of independent cavalry.

The infantry includes: An inspection of mountain troops, 48 brigade commands, 3 brigade commands of Alpine troops, 2 regiments of grenadiers, 94 line regiments, 12 regiments of riflemen each with four battalions of three companies, the fourth battalion being cyclists.

The cavalry includes: A general inspection, 3 division commands, 8 brigade commands and 29 regiments and remount depots with reserve squadrons.

The artillery includes: A general inspection, one of manufacture independent of the former, 9 commands of field artillery, 4 of fortress artillery, 36 regiments of field artillery, 1 of horse artillery, 1 of mountain artillery, 2 of heavy field artillery, 10 of siege artillery [artilleria de plaza].

The engineers include: A general inspection, two troon commands, 5 territorials, 6 regiments (24 battalions, 69 companies, 6 depots), a battalion of specialists (5 companies), 10 train companies, etc.

The new law gives legal recognition to bodies previously organized and charged with the study of the problems of national defense.

ITALY—Continued

Each infantry regiment includes a number of surplus officers and enlisted men who are intended to serve as the nucleus for new units to be formed from the mobile militia when mobilization is ordered. This includes in each regiment a commanding officer, 3 captains, 3 lieutenants, 90 enlisted men; a total of 96 commanding officers; 288 captains, 288 lieutenants and 8640 enlisted men.

To each regiment of artillery is assigned a depot which also serves as a base for the organization of new units from the mobile militia when a war footing is assumed.

Each army corps includes two regiments of divisional and one of corps artillery—a total of 96 guns.

The field artillery is or has been armed with three types of 75 mm. guns. The 75A is mounted on a non-recoil carriage and has a range of 7000 meters. The 75 mm. mod. 1906 (Krupp) has a range of 5800 meters, and the 75 mm. mod. 1911 (Deport), has a range of 6850 meters. Both the latter types are rapid-fire guns. It is possible that all the 75 A's have been replaced.

The mountain artillery is armed with two types of guns: one of 70 mm. firing a 4.9 kg. shrapnel with a range of 5000 meters, or a 4.8 kg. shell with a range of 6,620 meters, the other a 65 mm. piece firing a 4.2 kg. shrapnel with a range of 5,100 meters.

The heavy artillery is in an embryonic state. It is armed with 149 mm. Krupp howitzers. The projectiles are shrapnel and shell, each weighing 41 kg.

The infantry rifle, mod. 1891, is 6.5 mm. caliber. The machine gun (Maxim type) is of the same caliber.

On August 1st, 1914, the armed forces of Italy consisted of 400,000 men. On August 2nd the classes of 1889 and 1890 (year of birth) were summoned to the colors, which increased their strength to 650,000. By October 1st they had reached about 800,000 men.

The principal Italian naval forces consist of six dreadnoughts launched during the years, 1910-1913. The *Caio-Duilio* and the *Andrea-Doria* displace 22,700 tons with a speed of 23 knots. Their armament consists of 13 guns of 30.5 cm., 16 of 152 mm. and 18 of 76 mm. The 30.5 cm. guns are in five turrets on the axis. The second and fourth turrets are above the others and contain two guns each. The others contain three each. Their armor varies from 275 mm. to 100 mm. in thickness.

The *Conte di Cavour, Giulio Cesare* and *Leonardo da Vinci*, of the same displacement and speed, have 13 guns of 30.5 cm. similarly disposed, and 18 of 120 mm. and 18 of 76 mm. Their armor varies from 240 mm. to 120 mm.

The Dante-Alighieri, the oldest of the six, has a displacement of 18,400 tons. Its armament consists of 12 30.5 cm. guns in four triple turrets, 20 of 120 mm., 12 of 76 mm., and three torpedo tubes. Its armor varies from 250 mm. to 75 mm.

Besides the above, there are 8 pre-dreadnoughts, 4 armored cruisers, 4 scout cruisers, 36 destroyers, 33 torpedo boats, and 19 submarines.

—History

See

EUROPEAN WAR

TRIPOLI—ITALIAN OPERATIONS (1911-13)

—Military Topography of

See also

EUROPEAN WAR—SOUTHERN THEATER—NOTES ON OPERATIONS IN THE

JAPAN

—Aeronautics

See

AERONAUTICS—JAPAN

—Army

[Notes on the War. *Army & Navy Jour.*, June 5, '15. 50 words.]

The budget committee of the House of the Japanese diet has approved a measure providing for the addition of two divisions—about 24,000 men—to the Japanese army.

[The Japanese Army. Trans. from *Revue Militaire des Armées Etrangères* by Lieut. L. H. Drennan, 4th Inf., and Chaplain Henry Swift, Retd. *Jour. Military Service Inst., U. S.*, Jan.-Feb., '15. 5000 words; Mar.-Apr., '15. 6500 words; May-June, '15, 4500 words.]

The Japanese Army has continued to attract attention since the Manchurian war. In spite of financial difficulties, increased developments have been accomplished, and since that time Japan has almost doubled her military and naval strength.

Effort Realized in the War in Manchuria.

At the outbreak of the war the army consisted of an active army of 200,000 men, an army of reserve (Kobi), a territorial army (Kokumin), and the depots. The active army was composed of 13 divisions, 2 independent cavalry brigades, 2 independent artillery brigades, and 65 companies of fortress artillery, &c. By expansion this active army could be brought up to 340,000 men; the army of reserve to 100,000 men; the territorial army, including those men outside the country, reached about 90,000 instructed men; and the depots, including men not trained, claimed 800,000, of which about 80,000 had received some instruction.

By efforts of which the outside world did not believe Japan capable, nearly three times as many men as formerly estimated were put in the field, and *matériel* provided. The total effective strength with the colors at the end of the war was about 600,000.

In round numbers 47,500 were killed, 11,500 died of wounds, and 27,200 died of disease during the war,—a total of 86,200 men.

In addition, 240,000 were more or less severely wounded, 30,000 of whom remained invalids. A table is inserted showing the recruitment from all classes.

The total expense of the war was 1,508,-472,538 yen, and the average expense per day per soldier for maintenance was 55 cents. The government negotiated foreign loans of 1,320,000,000 yen and domestic loans of 680,-

000,000 yen, and at the end of the war the national debt was 2,154,098,000 yen.

Program of Expansion After the War.

At the end of the war the mobilized army consisted of 17 divisions, 2 independent cavalry brigades, 2 independent field artillery brigades, 19 battalions of fortress artillery, 1 railroad battalion, 1 telegraph company, and 1 section of balloonists.

The increase proposed since by the General Staff is not exactly known, but probably amounted to 8 new divisions, though the program proposed by the Government to Parliament was much less. A list of the principal increases, so far as known, is inserted. Railroad guards at the rate of fifteen men per kilometer of road are provided for. These are allowed by the Treaty of Portsmouth. The efficiency of the cavalry has been increased and the field artillery reorganized. The name "Fortress Artillery" has been changed to "Heavy Artillery," with a corresponding change of assignment of *matériel*. Other changes in organization and *matériel* are noted. The uniform is to be changed gradually from the dark colors to khaki and linen. New posts and barracks have been erected and camps of instruction enlarged. Hence increased appropriations, amounting annually until 1920 to over 201,000,000 yen.

It is interesting to note that the ministers of Japan are not held to an exact and detailed accounting for funds, and are able to transfer appropriations, organize reserves, &c., without prior authority.

Considerable of the detail of reorganization is noted, and mention is made of the fact that, of eight new divisions proposed, two had been organized by the end of 1910, and so far as known, none have been organized since.

Coincident with the military expansion began the naval increase, and tables are shown to indicate the character and amount.

The Emperor exercises executive power, with ministers responsible to him, while legislative power is vested in the Imperial Diet,—laws receiving the Emperor's formal approval.

Various laws from 1889 to 1906 are noted as governing recruitment. Service is personal and obligatory on all the male population between the ages of 17 and 40. In the active army the period is 3 years, in the first reserve 4 years and 4 months, in the so-called Depot Army 12 years and 4 months, and in the territorial army from 2 years and 8 months to 7 years and 8 months in the "first part" and the "second part" includes all men between 17 and 40 not included in the other armies.

The physical examination divides men into five classes, and certain exemptions, especially of men having large dependent families, are made. Several classes of students are also exempt. Of these exempt classes, certain of the students and teachers are acceptable as volunteers.

The number of men enrolled is not published.

Officers are secured from the Central Military Academy, graduates of certain civil schools, volunteers of one year's service, and, in exceptional cases, non-commissioned officers.

There is a School of Application for Infantry officers at Toyama, a School of Application for Cavalry at Tokio, a School of Application for Artillery and Engineers, a School of Fire for Field Artillery, the same for Heavy Artillery, and an Advanced School of War.

In 1910 there were 264 officers graduated from the Central Military Academy, and in the same year 715 officers graduated from the various other schools.

Officers get a small pay on retirement, with additions in case of disability.

Age limits for the various grades are set, as well as minimum periods between grades.

There follows a discussion of grades and qualifications of non-commissioned officers, a description of the constitution, of the reserves, the territorial organization, the stations of the various units, and the organization of the higher administration.

Armament and Ammunition.

The Infantry rifle is the 1905 model, with ramrod and bayonet, 6.5 mm. calibre, carrying a clip of 5 cartridges, weight complete, with magazine filled 4.055 kilograms; with sight graduation to 2400 meters. Each man carries 200 rounds of ammunition.—Hand grenades, to explode on impact, are furnished. Experiments are being made with a small mortar, to throw two grenades. Officers carry saber and pistol.

The Cavalry is armed with a carbine which has a ramrod and bayonet, and is of the same calibre as the Infantry rifle, but shorter and hence lighter. 105 rounds of ammunition are carried by each trooper; the privates also have a slightly curved saber, while the officers and non-commissioned officers carry a saber and revolver. The Engineers are armed as Infantry, and in the baggage trains the mounted men are armed as Cavalry and the dismounted men as Infantry. In the Field Artillery the gunners have a straight sword. The gun is model 1905, rapid-fire, 75 mm., wedge fermeture, Krupp aiming system, maximum range, 7350 meters; armor plated caisson. 135 rounds of ammunition are carried in the limber and caisson for each gun, with a regimental reserve bringing this up to 211 rounds per gun.

The horse artillery has the same gun, of model 1909. The mountain artillery also has a gun of the same calibre, but only 14 calibres in length, the weight of the entire piece is 500 kilograms, and the piece is carried by six pack-horses, each of which also carries 14 rounds of amunition. The heavy field-artillery has three kinds of rapid-fire guns, a cannon of 10.5 cm., a shell howitzer of 12 cm., and one of 15 cm.

Other types of artillery in use are shown by a table.

The rapid-fire guns using small-arms ammunition are carried on pack-horses, and each infantry regiment has a rapid-fire gun company.

JAPAN—Continued

A description of the uniforms is given, and the equipment for the field and a list of tools are shown in some detail. Then follows a description of the ration of which a man carries a two days' supply in his haversack. The method of cooking and the capacity of the cooking outfits are also detailed.

[The Japanese Army. *Jour. Military Service Inst. U. S.*, July-Aug '15. Concluded from previous numbers. Tables.]

Mobilization

1. In Time of War

On a war footing the army consists of the standing army mobilized, the reserves, the draft supply, and the territorial army.

The probable distribution of the fractions on mobilization are stated,—the strength of the active army probably being nineteen complete divisions, with some additional brigades and regiments for auxiliary service; that of the reserves the same number of divisions, but with fewer auxiliaries for outside service; the draft supply not being organized except for recruiting purposes; and the territorials being a certain number of complete units corresponding to certain units of the active army.

The strength of the active division is shown in detail to be an aggregate of 432 officers and 13,652 men as combatants and 191 officers and 4680 men as non-combatants, with 4831 horses and 1682 vehicles. Certain minor changes are proposed as shown by a table. The reserve division has slightly less strength.

The war strengths of units are stated in a table—a regiment of Infantry having 2791 combatant and 276 non-combatant enlisted; a regiment of Cavalry of three squadrons 541 combatant and 117 non-combatant enlisted, and a regiment of four squadrons 596 combatant and 146 non-combatant enlisted; the artillery has no regimental organization but a group of three batteries of Field Artillery has 383 combatant and 67 non-combatant enlisted [Note: the large number of non-combatants is not here explained—Ed.].

The active army when mobilized will number approximately 400,000 bayonets, 17,000 sabers, 1386 pieces of field artillery, 288 pieces of heavy artillery, and 1000 pieces of siege and fixed artillery, and would require about 25,000 officers and a total of 800,000 men (including non-combatants) and 200,000 horses [Note: here again the large number of non-combatants is not explained—Ed.].

Of about 1,500,000 horses in Japan scarcely 200,000 are fit for service, and to supply the lack recourse must be had to foreign markets.

It is estimated that, in a few years, Japan can count on 1,500,000 instructed men.

The article concludes with a vocabulary of useful terms to enable the reader to get a good knowledge of the Japanese military terminology.

[Japanese Army Increase. Note. *Army & Navy Jour.*, July 3, '15. 150 words.]

It has been announced in the Japanese Parliament that two additional divisions, making six in all, will be added to the Japanese army as soon as financial conditions permit. It is doubted whether this will occur in the near future.

—Army—Organization

See

ARMY—ORGANIZATION—CHINA AND JAPAN

—History

See

CHINA—HISTORY—1915
EUROPEAN WAR
RUSSO-JAPANESE WAR

—Navy

See

BATTLESHIPS—COMPARATIVE POWER OF
EUROPEAN WAR—NAVAL OPERATIONS

JAPANESE-RUSSIAN WAR

See

RUSSO-JAPANESE WAR

JAVA

See

DUTCH INDIA

JOFFRE, Gen. Joseph-Jacques-Césaire

[*See* article in *Atlantic Monthly* for Mar., '15.]

Gen. Joffre, commander-in-chief of the allied forces in France, was born at Rivesalter, France, Jan. 12, 1852. His father was secretary of the *mairie*. After leaving the elementary school at Rivesalter, he attended Perpignan College and afterwards the *lycée* at Montpellier, where he completed his course in the classics and in mathematics before he was sixteen. Sept. 21, 1869, he was admitted to the Ecole Polytechnique, a military college, difficult to enter, standing fourteenth on the competitive list. At the outbreak of the Franco-Prussian War (1870), Joffre, then eighteen, was appointed sub-lieutenant in the Engineer Corps, but saw little active service. On Sept. 21, 1872, he received his commission as lieutenant.

Shortly after the war of 1870, he was employed in the transformation of the outworks of Paris and Pontarlieu. Later he was made captain and accompanied Admiral Courbet to the Pescadores Island and organized the defense of Formosa. In Africa, Joffre built the railway from Kayes to the Niger, conducted a column to Timbuctoo and occupied the city. This expedition he narrated in his only published work, *"La Colonne Joffre."* He also built the entire enormous fortifications of Diego Suarez in the island of Madagascar.

On his return to France, Joffre was appointed to a professorship at the Ecole de Guerre, the finishing school of breveted officers. His mastery of the technicalities of his specialty, his intellectual power and invariable self-control, made his promotion to the higher grades rapid. He had been nominated a colonel in 1897; in 1901 he became brigadier-general in command of the artillery at Vincennes, and in 1905 received command of a

division, and was also appointed member of the Technical Engineering Commission. In 1909 the command of the Second Army Corps was given him, with the inspectorship of military schools. In 1910 he became a member of the Superior War Council. A few years before he had married Madame Lozès. In 1911 he was made vice-president of the Superior Council, the virtual head of the French Army.

In conjunction with M. Millerand, minister of war, Gen. Joffre, during the former's tenure of office, restored the army to popularity, practically banished politics from it, and brought about a reorganization of the supreme command, giving undisputed freedom to the head of the army in case of war. At the outbreak of the present war his plans for defense were ready. On Aug. 20 he assumed supreme command of the allied armies.

[Gen. Joffre: The Victor of the Marne. By Captain X., of the French Staff. *Scribner's Magazine*, Oct, '15. 25 pages. Maps of the Battle of the Marne.]

[An interesting and valuable paper, much of which, however, will not lend itself to condensation. What follows is an abstract of the more technical parts.]

Although the French War Office was well aware of the German plan to break through Belgium, it was not prepared for the scale and the offensive dash with which the entire movement was carried out. For example, the Germans took the French by surprise by bringing their reserves into action as early as they did, reserves as well trained, equipped and provided with heavy artillery as the active force. It was the German aim to finish France in a few weeks, then to fall on Russia while that country was still in the throes of mobilization. Hence but few men, relatively, were needed on the Russian front; the remainder, about 50 army corps, or 2,500,000 men, were thrown at once against France. Joffre's plan to meet this onslaught consisted in refusing battle with his left wing and center, and while withdrawing these two armies, so to concentrate his forces as to allow a shift from the east to the west. Accordingly, an army was formed (Aug. 25) under Maunoury to menace von Kluck, and two days later another under Foch, at the center of the French line. Ten days before the Marne, Joffre had made all preparations for it. As soon as von Kluck should advance sufficiently to uncover his right, the battle was to begin. This happened Sept. 4. Joffre's order for the battle is of the same date, and directed that the offensive would be taken on the morning of the 6th. Maunoury, attacking on the 6th, drove back von Kluck. So critical was the German situation that an attempt was made to relieve it by breaking through the French center near Fère Champenoise. But this effort was finally brought to naught by Foch's despatch of a division from left to right, thus catching the German's on the flank. The slaughter of the Germans was prodigious. General Joffre is quoted as saying that this was one of the main causes of the German retreat.

The victory of the Marne was immense, gigantic. It took place along a front of 400 km. from Paris to the Vosges. It is a mistake to consider it as the result of Maunoury's maneuver alone. It is equally a mistake to suppose that had von Kluck attacked Paris instead of turning off southeast, the victory of the Marne had not been. The truth of the matter is that von Kluck could not dream of besieging Paris before disposing of those forces on his front and flank, that would assuredly have fallen on him as soon as he began the siege.

The German orders given before the battle of the Marne are in the possession of the French staff; moreover, the German wireless cipher was an open book to the French. It thus appears that the Germans had but one object: to drive ahead as hard as possible, unhampered by strategical scruples. The different German armies were simply racing to the center of France, and the fastest was to win the prize. [An illustration of this policy is found in the attitude and sayings of von Kluck on Sept. 6, for which reference must be had to the original.] The entire German army shared the views of this typical chief, von Kluck. But General Joffre has the most absolute faith in the success of the Allied cause, because the German views carry the germs of final disaster; victory is therefore mathematically assured to the Allies.

"The whole aggressive plan of campaign of Germany was based on a short, sharp assault, lasting a few weeks or a few months, That was why she did not scruple to expend her maximum force at the outset. At the very first shock she utilized everything she could dispose of; and hereafter her strength, instead of increasing, must steadily diminish. Our own, on the contrary, is in almost all respects as steadily increasing. We have abundant reserves of men, since, in contradistinction to the German method, we have made only a small number of new formations. The English army is constantly growing. Italy is flinging into the *mêlée* her fresh troops, numbering, at the minimum, one million five hundred thousand men; and there still remains the inexhaustible reservoir of Russia. We are manufacturing more and more shells, and every day proves more emphatically the preponderating part which ammunition plays in the present war. Finally, our heavy artillery, which was deficient at the outset, is daily becoming more considerable..

"These are only some of the reasons, all as solid as granite, on which the robust optimism of General Joffre is based. When people speak to him in discouraging tones he merely shrugs his broad shoulders and smiles. The one thing to beware of, in his opinion, is impatience. Germany is virtually a besieged citadel. She is holding firm to the very last moment, she seems to be making light of her enemies, she never ceases to proclaim her invincibility. But some day the citadel will fall, and all will be over.

"Immediately after our victory on the Marne, the Germans took to the trenches. That fact was of itself more than a half-

JOFFRE, Gen.—Continued

confession of failure. For it should be noted that they might have retreated a little farther (as we ourselves had done two weeks before), and then maneuvered in such a way as to deliver a new battle which, if they had won it, would have given them decisive results. Instead of that they condemned themselves to the wearing-out process of trench warfare, which precluded all possibility of a quick and resounding success. The hope of such a success is over for all time."

[For the study of General Joffre as a man, the original article should be consulted.]

JUMPING

[Jumping. Extract from an order issued by Brig.-Gen. James Parker, Comdg. 1st Cav. Brigade. *Jour. U. S. Cav. Assn.*, Apr., 1915. 400 words.]

[Emphasizes the necessity of avoiding restriction of freedom of horse's head, or penalizing his mouth, due to undue tension on reins; and the desirability of maintaining a fixed relative position of the rider's center of gravity during the "take off" and jump. Indicates precautionary and corrective measures.]

KIEL CANAL

[The Kiel Canal. Gustavo de Montand. *Memorial de Ingenieros*. Madrid. June, '15. 6000 words. Diags.]

The Kiel Canal is not the first to give communication between the North and Baltic seas. A small canal was constructed at the end of the 14th century, uniting Hamburg with Lübeck; and since that time, two other canals have been cut through the peninsula. The first Kiel Canal was opened in June, 1895. Since that time the constant increase in tonnage of the vessels using the waterway, made it necessary to enlarge it, especially for vessels of war. This work was begun in 1909, and the opening ceremonies of the present great canal took place two months before the outbreak of the present war.

Its military importance is that of maintaining supremacy both in the Baltic and on the German coasts of the North Sea by a short route; and the allied French and English fleet, though about twice the strength of the German navy, would have to pass around the Danish peninsula to blockade both ends of the line.

The entrance to the harbor of Kiel is about five kilometers from the point where the canal first narrows; but the harbor is thoroughly protected by heavy guns. The western exit of the canal, in the estuary of the Elbe, is about 30 kilometers from the exit of the canal proper; and the Island of Heligoland further protects the western entrance.

Its commercial importance is increasing rapidly. In 1897-98, 9,396 steamers used the canal; while in 1911-12 the number was 23,778, with an increase in tonnage of nearly 400%; and the increase in smaller vessels was in the same proportion.

The canal passes from the mouth of the Elbe by a double lock, and into the bay of Kiel likewise. The course of the canal is somewhat crooked, 98 kilometers in length; and is provided with several passing places. Most of the country traversed is flat and marshy. The level of the canal is that of the sea, the terminal locks protecting the canal from tidal fluctuations. On the Elbe end the locks are operated about half the year, while on the Baltic end they remain open about three hundred and forty days each year, due to the small tides. The bottom of the canal is level from the Baltic to Rendsburg, and has a slight downward slope from there to the Elbe, thus producing a gentle current in that direction. The Eider River, entering west of Rensburg, gives a flow toward the North Sea of about 1-10 fresh water, while from Kiel to the mouth of the Eider the water, coming from the Baltic, is salt. This retards freezing until the temperature has lowered below the freezing point of fresh water. The discharge into the Elbe is about 370,000 cubic meters during each low tide.

The work of enlargement consisted of increasing the depth from 9 to 11 meters, and widening from 67 to 102 meters on the water line and 30 to 44 meters on the bottom. The line of the new canal follows that of the old, except in two places. The radii of all the larger curves are more than 2500 meters—only three having less, these being between 1800 and 2500 meters. Some of the passing places are 300 meters wide, and these permit turning. The lengths of these places vary from 600 to 1100 meters.

In order to interfere as little as possible with navigation, most of the excavation was dry, with excavators and suction machines; and, in general on one side only of the canal. The earth was removed by rail or on scows, and was dumped in swamps or at sea. The amount of earth removed in the enlargement reached one hundred million cubic meters. In the excavation through swampy ground heavy foundations were laid and dikes built to prevent caving and wash into the canal.

The old canal was crossed by seven bridges. The new canal has a fixed bridge at Grünental and one at Levensau, a railroad drawbridge and four high fixed wagon bridges at Rensburg, and a wagon bridge at Holtenau.

The old locks are retained and can be operated when desired.

The size of the new locks compares as follows with those at Panama:

	Length, including thickness of gates. (Meters)	Width, inside. (Meters)
Kiel	330	45
Panama	305	33.5

Each lock is divided into two compartments; and the lateral wall separating the two locks (they are double, as heretofore noted) is 16.5 meters thick; while the outside walls are 8.5 meters on top in the widest part. The conduits have a cross section of 22 square meters.

Taking the datum plane at 20 meters below mean low water, the bottom of the locks at the Kiel end are + 6 meters, thus maintaining a mean depth in the locks of 13.75 meters, since the mean level of the Baltic is +19.75 meters. The mean level of the canal is +20.10; and the level of the landings at the

locks is +23.75, thus permitting easy access at all times to vessels in the locks.

The mean depth of the canal being 11 meters, it will be necessary, in case of further enlargement, only to dredge the prism to the size of the locks.

The gates are of heavy framework, filled by horizontal beams, like a Venetian blind, with the faces covered by heavy iron plates on the convex side. Each lock has an interior set of gates, so that a part only need be used. The outside gates are built for pressure from one direction only, while the interior gates resist pressure from both directions. The weight of the gates varies from 700 to 1300 tons, and they are operated by electric motors of 175 H. P.

Each gate offers 25 tons resistance to movement; rapidity of manipulation is 0.35 meters per second; and the time of opening or closing is 2 minutes. (Details of the work of construction follow).

The cost of enlargement of the canal was 223 million marks (about 60 million dollars). The old canal cost 156 million marks.

KITCHENS, Military

—Field Ranges

[Improvements in Camp Equipment. By Lieut. E. J. McKeig, R.E. *Royal Engineers' Jour.*, Nov., '15. 500 words. 4 figs.]

Herein is described a field cooking range, in which the aim is to utilize the same fire for kitchen and oven, thereby effecting a great saving in fuel. It consists of several iron grids and an oven. The grids are laid on the ground over two or more sections of 9-inch trench, radiating from a common center, and each accommodating several 12-quart kettles. The oven, which is collapsible, is placed at the central angle, and may in practice be advantageously covered with clay.

—In the Field

See also

TENTS—FIELD KITCHEN

—In the Field—Kitchen Wagons

[Feeding a Regiment in the Field. By Capt. C. F. True, National Guard, N. Y. *Nat. Guard Magazine*. Feb., 1915. 2300 words. Illus.]

The 71st Infantry, N. G. N. Y., was subsisted during the 1912 maneuvres in Connecticut by consolidated battalion messes using the kitchen wagons of the author's design. Each battalion mess corps comprised a commissary sergeant, three cooks, and three helpers. The kitchen wagon packed was of the same weight as the army wagon. It had a range with hot-water tank mounted on the rear axle, with two 50-gallon fireless cooker cans. Soup or stew in one and coffee in the other formed the foundation of a hot meal on the march. An icebox was fitted on the front of the wagon.

The sides were detachable and easily fitted with legs to form serving tables. Two other tables, rations, and necessary utensils and tools were stowed on the wagon.

Economy of labor and stores, and prompt service of meals under all conditions resulted from this system. Proper regulations for packing the wagons insured prompt movement. Instructions for cooking and serving the meals and for the care of the kitchen wagons insured cleanliness and the observation of due sanitary precautions.

[Trial of Army Rolling Kitchen. *Army & Navy Register*. May 22, 1915. 250 words.]

A rolling kitchen has been sent to Texas for test under service conditions. This kitchen will provide coffee and hot "stew" for 250 men. This advantage in the matter of subsistence is offset by the fact that transportation difficulties are increased, a serious matter in rough country.

KITE BALLOONS

[The Goodyear Military Kite Balloon. *Flying*. Mar., 1915. 600 words, illus.]

The Goodyear Tire and Rubber Company, of Akron, Ohio, have designed a military kite balloon closely resembling the types used in Europe. This balloon cubes 20,000 feet, is 70 feet long by 20 feet in diameter, and is driven by a 20-H.P. electric motor. It is controlled by a winch winding 1000 feet of special 3.8-inch steel cable, and is equipped with insulated telephone conductors and 100 sand bags; it carries two observers with observation apparatus.

"KOENIGSBERG"-"SEVERN" ENGAGEMENT

[Navy Notes. The *Königsberg's* End. *Army & Navy Gazette*. Aug. 28, 1915. 350 words.]

Every day there are fresh indications of the important and indispensable part air-craft have come to play in naval operations.

The destruction of the *Königsberg* emphaphasizes this point particularly. It was this factor which enabled the *Severn* to reduce to "a flaming mass of twisted iron work" the *Königsberg*, three times her size. It was not necessary for the *Severn* to sight her opponent because of the aeroplanes. The *Königsberg* fired salvos of four guns for seventeen minutes before the monitors could reply, and when the *Severn* came into action a hit was not scored until her seventh salvo. The first four were signalled from the aeroplane, "did not observe fall of shot." After this the British gun layers were rewarded by learning that their shots were getting home and eight hits were scored in the next twelve shots. After the range was obtained the aeroplane signalled that all the hits were forward and a move was made to left to get the *Königsberg* amidships. Soon her salvos were reduced to two and finally ceased an hour after the action began.

One lesson of the affair seems to be that the side "which can establish the most complete and effective coordination between as many different arms as can be usefully employed has an enormous and perhaps decisive advantage."

KRUPP STEEL WORKS

[The Krupp Steel Works. Anonymous. *Review of Reviews*, June '15. 1400 words. Illus.]

Back of the German army and navy stand

KRUPP STEEL WORKS—Continued

the Krupp Steel Works, the greatest gun factory in the world. Situated sixty miles northeast of the Belgian frontier and with Belgium occupied by the Germans, these works are comparatively safe from attack, aerial or otherwise.

Originating as a blacksmith shop in 1811, the Krupp Company is now capitalized at $62,500,000, with fifteen subsidiary companies and over 500 branches in Germany and elsewhere in Europe.

The Krupp works comprise five separate groups. The principal of these is at Essen, with proving grounds at Meppen, Janger-Hütte, and Essen. The works cover 500 acres, and comprise 7200 machine tools, with rolls, hammers, presses, cranes, and other equipment in proportion. This establishment consumed 3,000,000 tons of coal last year.

The second group of works is the Friedrich-Alfred Iron Works at Rheinhausen, with six blast furnaces. The third is the Annen Steel Works, producing steel castings up to 25 tons.

The fourth is the Gruson Machine Works at Magdeburg Buckan, comprising more than 50 shops, covering 75 acres, and housing 1850 machine tools and other equipment corresponding.

The fifth group is the naval section,—the Germania shipyards at Kiel, containing eight building slips of which two can accommodate vessels up to 725 feet long.

In addition to manufacturing in time of peace railway equipment, motor cars, and other steel products, the Krupp works make every kind of war material.

The masterpiece of the Krupp works was the 42 cm. siege howitzer, sprung upon the world as a surprise in the present war. Such secrecy attending the creation and testing of such a weapon attests the devoted loyalty of the employes. This loyalty is secured by good wages and considerate treatment. The entire energies of the Krupp works are now devoted to the production of war material, and 46,000 men are employed. Some of the employes have been recalled from the front, so important is the product of the Krupp works to the German war machine.

LANDING OPERATIONS

See
DARDANELLES, OPERATION AT THE (1915) —LANDING OPERATIONS

LAW, Military

See
COURTS-MARTIAL
INTERNATIONAL LAW
MARTIAL LAW
WAR—LAWS OF

LEON TORPEDO

[The Leon Torpedo. *Mem. de Artill.* (Spain), April, '15. 350 words.]

This is said to be the type of torpedo used by the Turks in destroying the vessels of the Allies on the recently attempted passage of the Dardanelles. The proper submersion is maintained by an electrically driven propeller which automatically starts and stops as required.

It is made in two types: one 0.46 meters and the other 0.53 meters in diameter. The range of the latter is 1600 meters.

LIBRARIES, Military

[Military Libraries. By Lieut. Giorgio Cristani. *Riv. Mil. Italiana,* Apr., '15. 4800 words.]

It is important to distinguish between the military library, intended for the professional culture of those devoted to the career of arms, and the ordinary library intended for general culture. The presence in a military library of publications not of a military nature, however valuable they may be from other points of view, is an indication that the limited funds available for the library are being expended injudiciously.

In a general library it is a part of the function of the librarian to prepare the books for the public, to aid and direct in the selection of books, and to guide and form the taste of the public.

In a professional library it is assumed that each patron knows what he wishes to ascertain, and he should be as free as possible from all domination of the librarian. All he asks is to have proper lists and indexes kept up to date.

The military man needs two kinds of culture: that of a general nature derived from schools, institutes, libraries, reading rooms, etc.; and another of a different kind, professional or technical, begun in barracks, or in military schools and schools of application for the different arms, and completed by himself with the aid of a real and proper military library.

Such a library should contain whatever relates to the technical culture of its frequenters, just as a medical or mathematical library contains whatever pertains to its specialty, and nothing more, unless received as a gift. It should contain a reading room for soldiers, in which place should be kept any books that may be given to the library. A small amount, such as $60 per year, spent on additions, will finally provide copious and valuable material.

One or two libraries in a country should collect works of general military interest. The others should devote themselves to some specialty, such as military aviation, military history, military architecture, etc. If a student wishes to pursue a subject covered by a library at another station than his own, he should be allowed to borrow the necessary books, to be returned within certain limits of time.

The library should be as free to the private soldier as to the general officer. Distinctions of rank in a military library are as much out of place as would be distinctions between classes of society in the public library of a city.

There should be no question as to allowing books to be taken from the library. The student must be able to collect his material in the quiet of his own house, rather than amid the confusion of a reference room in

the library. This is the system followed in all the university libraries of Germany. Experience shows that the regulations for the return of books on time must be enforced with absolute severity and strict penalties.

The loan of books from one locality to another will be greatly facilitated by lists and catalogues kept strictly up to date.

—Post Libraries

[On Military Libraries. By "Buttgenbach." *Jour. Military Service Inst., U. S.,* Sept.-Oct., '15. 1700 words.]

As a class we do little professional reading, as may be deduced from the few military books published in this country. For our best military thought we go abroad, and many of our text-books are adapted from outside sources. There are many reasons for this; our officer corps is small and busy, and afraid of being considered book soldiers. Our garrisons are so small that problems must usually be based upon theoretical grounds. But, to keep up the professional requirements recourse must constantly be had to books, and a library system in the army would be a valuable ally.

The post library has outlived its day; it rarely contains books of military value and it has, in great measure, been supplanted by company reading rooms.

The Officers' Post Library suggested would furnish only professional reading matter and would be divided into two parts, one for books and one, the more important, for periodicals. The war college division and the librarians of the service schools could furnish suggestions as to the best books, keeping in mind the fact that quality and not quantity is desired. After a nucleus had been established, a few books a year would keep it up to date. The principles of strategy are almost fixed, while those of tactics are constantly changing, so in the selection of books we need seldom go further back than the Napoleonic campaigns. Of our own history we should have a good working knowledge, especially of the civil war. Each library would contain books of special interest to the branch of the service using it.

Each library should keep on file copies of our service publications, two or three from England and, in the larger posts, one or two from France and Germany. The papers should be loaned to officers for short periods of home use. Periodicals show what the service is thinking of, and by interchange of journals we learn the viewpoints of other branches than our own.

The entire system of libraries should be under the war college division. In order they should stand, those of the war college, service schools, department headquarters and posts. Post Libraries should be under charge of the adjutant. A standard collection of a certain number of books would be kept for six months and passed on to the next library. Each library would be allotted a certain sum for periodicals or an exchange list arranged.

MACHINE GUNS

See also

INFANTRY—ARMS—RIFLE—AUTOMATIC
SCHWARZLOSE MACHINE GUN

[Machine Guns. By Capt. M. Alcantara. *Boletim Mensal,* Feb., '15. 1300 words.]

A brief statement of the ground covered by two volumes (M. Alcantara) on Machine Guns:

Vol. I.—Theory of machine guns. Comprises: Origin and evolution of machine guns. General problem of the machine gun. Modern conception of the machine gun. Practical value of systems and types. Fire of—past, present, and future of. Technical considerations. The use of machine guns in connection with other arms.

Vol. II.—Description of types. (For details refer to volumes noted.)

United States

[Our Machine Gun Organization. Editorial. *Infantry Jour.,* July-Aug., '15. 500 words.]

For fifteen years we have muddled along with a tentative, unsatisfactory organization. 50,000 machine guns in the German army would indicate that they need no longer be considered in the experimental stage. Let us have a permanent machine gun company of six guns in each regiment of infantry and of cavalry. The status of this company should be as definitely fixed as that of any other company. The machine gun has come to stay, and actual experience is apt to be costly.

—Ammunition

[Packing box for machine gun ammunition. *Arms and the Man,* Sept. 23, '15. 50 words.]

A metallic packing box for machine gun ammunition has been developed at the Frankford arsenal, and eighteen are under manufacture for test. This box is much less expensive than the wooden one heretofore used.

—Anti-Aircraft Firing

[More Machine Gun Firing. *Arms and the Man,* June 10, '15. 350 words.]

Experimental firing with the Benét-Mercier automatic gun has probably made a record in practice at aeroplane kites. Twenty-five exercises were held at Texas City. Some of these at land and at water targets (ranges 400-1200 yards): four shoots were at a miniature kite aeroplane (2500-3000 feet elevation) and one (1500 feet elevation) in competition with expert riflemen. In the first three of the four mentioned, 90 rounds each were fired at the kite, 4 ft. 2 in. x 3 ft. 8 in., the record being: (a) 2 ribs broken, 8 hits, elevation 2500 feet; (b) one rib broken, 26 hits, elevation, 2000 feet; (c) 16 hits, 2000 feet. In the fourth case, 170 rounds at 3200 feet elevation made 42 hits. It is estimated that at least 20% of shots fired passed through a rectangular opening 18 x 18 inches in the center of the kite and were not registered.

[The War in Europe. *Army and Navy Jour.* Oct 23, '15. 100 words.]

A new aeroplane machine gun weighing fifteen pounds has been patented in France. Tests have been made and one of the factories engaged in making machine guns for the French government will be devoted exclusively to production of the new gun. The new gun has about the same power as the old, which weighed 55 lbs.

MACHINE GUNS—Continued

—Field Use of

[The Use of Machine Guns in the Field. By Captain Francesco Roluti. *La Nuova Rivista di Fanteria.* May, 1915. 4500 words.]

The mitrailleuse used by the French in 1870 had 25 barrels which were discharged simultaneously. This gun did not give satisfactory results. Improvements made in recent years have increased the ballistic power and made the gun lighter. The changes in regulations giving the machine gun sections greater mobility and ability to operate on varied ground, have brought the gun into favor and now military experts recommend its adoption for the infantry.

Fire Action and the Advance.—The tactical object of any attack has always been to dislodge the enemy. With the adoption of modern fire arms there has arisen the problem of harmonizing the infantry advance with fire action. We shall try to follow out the evolution caused by numerous improvements of firearms.

Frederick II solved the problem of fire action and advance by quick movements from line into column. During the artillery fire the infantry was changing from line into column and executed the assault as soon as the artillery fire ceased. They arrived on the enemy's line before the latter could recover from the losses inflicted by the artillery. With the improvements of fire arms the movements of the attack could not be executed quickly enough to prevent excessive losses, so that new tactics had to be employed. It was necessary to use lines of skirmishers to cover the approach of the troops who were to make the assault. In 1866 the Prussians introduced the idea of making the assault with troops in skirmish line. In 1870 the Germans used these same tactics against the French. The German artillery being numerically stronger than the French could silence the latter and then use its infantry and artillery against the French infantry alone.

In the Boer war the Boers used their artillery only against the English infantry and on account of the efficiency of that artillery the attacking infantry always lost heavily. After the Boer war a new school of tactics sprang up. The members of this school believed that the attacking artillery should never seek an artillery duel with that of the defense as the latter was usually too well covered to be damaged seriously. Any obstacle to the advance of the attacking infantry should be crushed by its supporting artillery. The present tactical principles relating to the work of the artillery and infantry are based on observations in the Russo-Japanese War.

Field artillery is used where the firing lines are separated by considerable distances, and machine guns when the lines are close together. The machine gun uses a great deal of ammunition and keeps close to the firing line. On account of the difficulty of supplying this ammunition when lines are close together the machine gun should only be used when it is effective.

Rules for the Machine Gun Section. On the march the section is directly behind the battalion to which it is attached, and its commander is with the battalion commander. At the time of the deployment and the approach the section is with the reserves. The attack usually begins about 1000 yards from the enemy's lines. From then till final assault the machine gun is very valuable as a support.

Fire Action.—After receiving his orders the machine gun commander chooses his position, the way to reach it and the target he is to fire on. He usually begins firing by order of the battalion commander when about 900 meters from the enemy.

Special Missions.—In an advance guard the machine gun may be used for holding strong points and for flank firing on the enemy. It may be used by the rear guard to force the pursuers to make detours. In pursuit it may be used to fire on fleeing troops and to occupy strong positions quickly. On the defense it is used for increasing the fire action in weak parts of the line and at salient points. It is used for covering important points on roads and narrow defiles. A substitute position to which it might move when necessary, should be prepared. When a position is to be held by a small number of men the machine gun, on account of its volume of fire, is valuable. If a night attack is expected these guns are trained at points along the front for a distance of about 500 yards. At times several sections may be detached for special work.

Being usually attached to a battalion the machine gun section will have no other escort unless it is sent out on a separate mission. If one of these sections is attacked by the enemy it becomes the duty of any infantry command to come to its support without orders.

—Firing

[Machine Gun Experimental Firing. *Army & Navy Jour.*, May 29, 1915. 400 words.]

Report has been made to the War Department covering 25 combat exercises with Benét-Mercier machine guns. The exercises comprised firing on main range at 600-1200 yards, night firing from land and day firing from boat at floating target; firing at miniature kite aeroplane, and day firing in competition with expert riflemen.

The firing at the kite aeroplane was a new exercise, and from 10% to 25% of hits were secured at elevations varying from 2000 to 3200 feet. The results of the night firing were exceptionally good. The bull's eye was illuminated by a 1 c. p. lamp. In many of the night firing exercises over 50% of hits were made. The exercises were conducted by Lieut. K. P. Williams, 26th U. S. Inf.

—Organization

Great Britain

[The New Machine-Gun Corps. *Arms and the Man*, Nov. 18, '15. 300 words.]

Great Britain is to form a regular machine-gun corps to be divided into three branches, cavalry of the line, infantry of the line, with the recently formed and existing motor machine-gun service as the third. The cavalry and infantry branches are to be formed into brigade machine-gun squadrons and compa-

nies; the motor machine-gun service will b- organized as motor machine-gun batteries.

—Shields for

[A Portable Folding Shield for Machine Guns. *Arms and the Man.* Sept. 2, '15. 275 words. Diag.]

This shield consists of three curved plates, radius 3 feet, connected by hinges. The center plate overlaps the side plates, 3 inches, and is slotted to take the muzzle of the gun. The shield weighs 200 lbs.; set up, is 4 feet 6 inches high, and 5 feet wide; it is estimated that protection will thus be given to the gunner and two assistants; the plates are 1/4 inch thick. For transportation, the side plates fold inward, over the center plate; four rings are provided for carriage; these may be connected in pairs by a short length of rope.

—Tactics

[Machine Guns and Their Fire. By Edmund C. Crossman. *United Service Mag.* Apr., 1915. 4200 words, tables.]

It is a question whether the British machine-gun service has been brought up to its highest efficiency, as demonstrated by American experiments with picked gun crews. In the U. S. Army experiments, machine guns handled by trained pointers were pitted against a certain number of expert rifle shots, both sides firing the same number of rounds. From these and other experiments the following facts were demonstrated: "That from 600 to 800 yards, infantry and machine-gun fire, round for round, is equal in effectiveness. Below 600, infantry fire is slightly more effective. From 800 yards and on the machine gun is more effective, and the effectiveness increases as the range grows longer." However, under fire it would be much harder to hold down one hundred men to well-directed fire than one or two well-trained gun pointers. Experiments also show that indirect machine-gun fire gives good results, while that of infantry is of little value This is because the machine-gun fire is directed by one man, gives greater dirt displacement with its "salvos" than infantry volleys, and is not subject to the dispersion of the latter. Comparative statistics of tests show the superiority of the machine-gun in indirect fire. Also, it was demonstrated that the machine gun can deliver canopy fire over its own advancing troops, which cannot be done by average infantry. The machine gun can deliver a sustained fire of one hundred infantrymen, with better accuracy and fire control; it can be used for canopy fire or indirect fire to drive out an enemy behind a crest or supports coming up under cover, and with a minimum target for the enemy.

The above results can be secured only with trained gun crews, which can be had only by separate machine-gun companies of permanent organization. "Infantrymen detailed haphazard for duty are nearly useless; they serve well enough until a pinch comes." The whole gun crew should be thoroughly versed in the mechanism of its machine gun, so that new parts can be fitted rapidly in case of breakage in action. "Then, again, . . . range finding, effect of fire, judgment of the proper target, and the most effective way to open on it, may fall on the n.c.o. or even the private in detached guns." The individual peculiarities, also, must be known to all who may operate it.

A heavy tripod gives better results than a flimsy one, and, best of all, is a permanent one for fixed defences. The recoil settles the tripod, and realignment is necessary after every few rounds. For this reason, and to economize ammunition, the fire should be delivered with short bursts of shots and then realigned. The very light guns are hold to hold on the target because of jarring and recoil. "Guns with extractors are prone to grief," as they very often break. It is sometimes hard to keep up the water supply, and, again, steam may give away the position. Air-cooled guns also have drawbacks. The heating of the barrel no doubt increases metal fouling. The changing of barrels has its troubles. Regardless of uniformity of manufacture, different barrels for the same gun have not the same elevation and lateral zero. One range set off on the back sight will fire a certain distance with one barrel and another distance with a second. The material of a machine gun must be of the best and the workmanship as perfect as possible, to stand the numerous strains it is subjected to.

—Use of in European War

[The Machine Gun and Its Development. By Neal Truslow. Our Correspondent with the French Army at the Front. *Scientific American,* Nov. 27, '15. 2300 words. Illustrated.]

The Germans have shown themselves superior to the French and English in anticipating military needs. The Germans believe in machine guns thoroughly. Statistics show that one machine gun properly placed can hold a battalion. Twenty-one Germans are known to have held a front of 1100 yards of trench for five months south of Soissons, and to have repelled several attacks on this front. A machine gun will make more hits than 50 marksmen, and there are rarely this number in a regiment. As a target hitter, a machine gun is equal to a regiment.

[The development is traced from early times, through the mechanical rapid firer (Gatling) to the modern automatic machine gun operated by recoil (Maxim), or by a piston operated by a part of the gas of explosion (Hotchkiss). These types are described.]

The Maxim machine gun weighs 50-60 lbs., and fires 450-600 shots per minute from belts of 250 cartridges each. It is water jacketed for cooling, but boils the water and discloses its position by the steam generated in prolonged firing. The Germans use pipes to convey the steam away.

The Hotchkiss machine gun has been adopted by the French army. It weighs 53 lbs. and fires 500-600 shots per minute. It is air cooled, with rings on the breech for additional radiation.

The Colt (gas operated) machine gun is used by the U. S. and British armies. It weighs 40 lbs., and is simple and compact.

A well known general at the Ecole Militaire said, "The English hold their trenches with the

MACHINE GUNS—Continued

infantry, the French with artillery, but the Germans with machine guns."

The Germans had 50,000 machine guns at the beginning of the war, and this number has since been enormously increased. They are virtually substituting machine guns for infantry. They hold their vast line with a few men armed with machine guns. The infantry is brought up only in emergencies and is not constantly exposed to bombardment. The machine guns are protected by steel plates, and can only be put out of action by a direct hit.

The Allies have followed the German lead, and both the French and English have established machine gun schools, and officers and men appreciate the necessity of this training. The advantage of the machine gun is obvious. No army can live before them. No strategy can outwit them.

[German Estimate of Machine Guns. By "Eye-Witness." *Weekly Edition London Times*, Apr 9, '15. 250 words.]

The loss of one or several machine guns by the Germans does not represent much to them. It is believed that they had a stock of 50,000 machine guns at the beginning of the war, apart from those since manufactured at the arsenals. Their employment might be carried out without particular regard to loss.

To the Germans the machine gun is merely a piece of man-killing machinery costing a certain sum of money. One principle guiding its employment is that if it has paid for its cost by the number of the enemy killed, its loss or destruction does not count. This applies to the gun itself but not of course to the men who handle it.

[Note. *Army & Navy Jour.*, July 17, '15. 200 words.]

The latest radical change indicated as possibly occurring in the present war is the substitution of the machine gun for the infantry rifle. Infantry thus armed and protected by concrete and barbed wire can hold off greatly superior forces. Germany is supposed to have had 50,000 machine guns at the beginning of the war, and may now have as many as 100,000.

MANN AEROPLANE

—Tractor Biplane

[The New "Mann" Biplane. *Flight*. March 6, 1915. 100 words. Illustration.]

This biplane carries its engine in front and the two chain-driven propellers in rear of the main planes. In the extreme nose of the very deep body is placed the seat for the observer or gunner, thus giving an unrestricted view. The pilot's cockpit is behind the main planes.

MAPS

See

SIEGE ARTILLERY, MAPS FOR
TOPOGRAPHY

MARCHES AND MARCHING

["Column Time" instead of "Road Space." By Lieut. W. R. Wheeler, 15th Inf. *Infantry Jour.*, Jan-Feb '15. 2400 words. Tables. Sketch.]

The Field Service Regulations in discussing road space, state that allowance for elongation of the marching column must be made according to circumstances. How can this allowance be determined under varying conditions of marching discipline, on muddy roads, at night, in January and in July, after suffering casualties of 10%, after detaching part of the force, with packs on wagons, or with the combat train added? What is the road space of a regular brigade and of a volunteer brigade?

Road space is eventually computed in time, therefore it is better to measure it in time. The time required for any unit to pass a given point should be designated the "Column Time" of that unit; the time of march corresponding to the distance between two units as the "Distance Time"; and the distance from camp to any designated point as the "Road Time." This applies to a mixed command of infantry and artillery. Though with different rate, any command could use it.

The method of estimating time of starting, etc., for an advance guard is exactly the same as at present, except that all terms are kept in the unit of *time*.

To find the time at which any unit of a column should leave camp, add all time elements of units preceding in the column, add distance times of unoccupied spaces in the column, also time equivalent of halts, and from the sum of these subtract the road time of the unit. If the result is negative, subtract it from the hour at which the leading unit clears the initial point; if positive, add.

MARINE CORPS

See also subhead MARINE CORPS *under names of countries*

MARNE, Battle of the

See also

JOFFRE

[The Battles on the Marne. *Artill. Monatshefte*, Mar., '15. 1500 words.]

The seven German armies advanced in the middle of August upon a broad front extending from Lunéville in Lorraine to Mons in Belgium. The French were supported on the line Toul-Verdun-Paris, with another army in the vicinity of Amiens for the purpose of outflanking the Germans. The advance of the Germans was however too rapid and the left wing of the French-English force was in danger of being surrounded on the Sambre. The French therefore abandoned the contemplated offensive through Lorraine and withdrew behind the Marne. The German right wing under v. Kluck gave up its direct advance on Paris, and all German armies hastened with all their forces to pursue the enemy who was withdrawing behind the Marne. On Sept 5th the German front extended from Meaux through Chalons to Verdun and then south to Lunéville and Lorraine. The French-English forces were

drawn up on the front Paris-Provins-Sezanne-Vitry-le-François-Verdun and south to Belfort. The armies of Generals Sarrail, de Langle, Foch and d'Esperey attacked along the front from Verdun to Provins while the English and the army of Gen. Manoury covering Paris, turned on v. Kluck's flank and threatened his communications. V. Kluck's withdrawal now compelled each of the other German armies to the east of him to withdraw to the Aisne. The French advance was made possible by the ability of Sarrail at Verdun and Pau in Lorraine to maintain their positions.

It is said that the German withdrawal was compelled by fatigue and exhaustion of their troops caused by long and rapid marches and by their inability to organize their line of communications and supplies after their rapid advance. On the other hand, the failure of the Allies to halt the German advance sooner is said to have been due to the greater rapidity of the German mobilization.

Early in October the armies opposed each other on the line as follows:—From Amiens south to Noyon, then east through Varennes to Verdun, around Verdun to St. Mihiel, thence east to Pont-à-Mousson, thence southeast to the Vosges at the Swiss frontier.

[The Battles on the Marne. Translation into English. *Field Artillery Jour.*, Apr.-June, '15, from *Artill. Monatshefte.*, Mar., '15. 1500 words.]

MARTIAL LAW

[The Power and Authority of the Governor and Militia in Domestic Disturbances. By Henry J. Hershey, Esq. [Extract from a report to U. S. Commission on Industrial Relations. *Jour. U. S. Cav. Assn.* Apr. 1915. 6400 words.]

[A very complete brief covering the decisions of the Federal and State Courts on the subject.]

MEDICAL CORPS

See

Sanitary service

MEXICAN WAR (with U. S.)

—Work of Engineers in

[The Engineers and the Mexican War. By Maj. Wildurr Willing, C.E. *Professional Memoirs.* May-June 1915. 9500 words.]

It is the purpose of this article to recall the conspicuous services performed in the Mexican War by the engineers, which "must ever be a source of inspiration and profitable study to their successors in that branch."

The need for engineer troops was first emphasized when Taylor's pursuit of the Mexicans on Texas soil was halted by the lack of pontoon equipage with which to cross the Rio Grande. Authorized on May 15, 1846, the first engineer company was organized under Capt. A. J. Swift, and reached the Rio Grande on its way to the front with Wool's army in October. The river, 800 ft. wide at this point, was crossed by means of a flying bridge; means for other difficult crossings had to be improvised during this march. In the advance on Victoria the next month, the "pick and shovel brigade" rendered the road practicable for the train.

During Scott's operations at Vera Cruz, the engineer company was employed in opening up new roads, destroying the underground aqueduct that supplied the city, locating and constructing (assisted by details from the line) the batteries and siege works, and later in mapping the captured city. Colonel Totten was Scott's chief engineer during this time. When the column started for Mexico City, the company marched at the rear; after Cerro Gordo and the resumption of the advance from Puebla, it had moved up the forefront, with the best of transportation. Among its important duties were the improvement of the roads by which Scott turned the city to the south, participation in the attack at Padierna and the surprise of Valencia's army, the construction of the batteries that bombarded Chapultepec, and an active rôle in following up that victory and entering the city. The company officers at this time were Lieuts. G. W. Smith and G. B. McClellan.

All told, there were 44 engineer officers in the war, 25 of whom were in the Topographical Engineers. Especially conspicuous were the services of the individual officers on staff duty. Both Taylor and Scott used these officers constantly in reconnoitering the enemy's positions; nearly every plan of campaign was based upon their reports, and the attacking columns were often guided by these same officers. Thus Mansfield at Monterey, Lee and Johnston at Cerro Gordo, Beauregard and Tower before Mexico City, and a dozen others, made notable performances. It was a striking tribute to the engineers that from their number were chosen five of the council of twelve that decided which point of the city fortifications was to be attacked.

For the Mexicans, it should be said that Robles, Santa Anna's chief engineer, was a skilful officer. He recommended against his chief's faulty position at Cerro Gordo, but was overruled. His strong defenses at El Peñon were never put to test on account of Scott's turning movement.

MEXICO

—History

See also

Mexican war (with U. S.)

Vera Cruz, U. S. operations at, 1914

—Internment of Mexican Troops by U. S. (1914)

[The Internment of Mexican Troops in 1914. By Capt. Geo. H. Estes, 20th Infantry. *U. S. Infantry Jour.*, May-June, '15. 8400 words. Photos.]

Among the various questions that have arisen between the United States and Mexico incident to the revolution in the latter country, no one presents more points of military interest than the reception, disposition and care of the different belligerents who have been forced over the border line and have sought refuge in the United States.

The earlier procedure was to disarm the small parties who came across and then to permit them to filter back into Mexico.

MEXICO—Continued

Finally when the Constitutionalists so overran northern Mexico that the Federals could not re-enter their country, it became necessary to make provision for the care of these refugees.

In June 1913 orders were issued directing all Federal prisoners to be held. These were later transferred to a detention camp at San Diego. The number reached a maximum when in Jan 1914 an entire division of Federals was forced across the border at Presidio, Tex. This division accompanied by some 2000 civilians, men, women and children, left Chihuahua under General Mercado, fleeing before Villa. The march to the border was long and painful and earned the name of the Jornada de la Muerte. At Ojinaga a stand was made, but after five hours of fighting the Federal Army was in flight across the Rio Grande.

The Mexicans were disarmed upon arrival and assembled, the animals were corralled. Order was soon established, companies and battalions organized and provisioned. The total was 3552 officers and men, 1667 women, 2780 pack and other animals.

The advent of these combatants brought up several points of international law which required immediate solution. The presence of civilians, women and children introduced an additional factor into the ordinary treatment of the question of internment. One point appears to be without precedent. No party in Mexico had been recognized as a belligerent by the United States; in fact there was no recognized government in Mexico.

The War Department, pending decision as to final disposition of this interned force, ordered that it be sent to Fort Bliss, by march to Marfa, thence by rail to El Paso. All were vaccinated for small pox, as several cases had been brought over and the possibility of an epidemic threatened. Trains were in waiting at Marfa and under conduct of a battalion of infantry, the refugees were entrained. By February 4, the last of the Federals had been forwarded to Fort Bliss. 1762 animals, 450 saddles and other equipment were transferred to the U. S. customs at Marfa. Property identified as belonging to the Mexican government was transferred to their consular representatives.

As soon as the decision was made to intern these Mexicans at Fort Bliss a wire stockade was built and the necessary guard detailed. A camp site of 27 acres was laid out, piped, and wired for lighting. Elevated sentry boxes at corners and middle of each side were built. The perimeter of camp was a rectangle 1880 x 720 feet. All unserviceable tentage, field ranges, tent stores, cots, cooking utensils, etc., were forwarded from all border posts to Ft. Bliss. Deficiencies were made up by issue. The two battalions ordered for guard were encamped in the immediate vicinity of the stockade. Their instructions were to care for the refugees as well as possible with the means provided by the War Department. The refugees were encamped according to their organization and each unit pitched its camp as staked out. Officers were held responsible for their organizations and finally learned that this was necessary. Firmness in requiring this responsibility, and firmness in sustaining these officers developed eventually such a discipline that no serious case of insubordination or misconduct occurred in this large camp during nine months. Administration was thus beneficially divided, the U. S. however, exercised supreme control over sanitation and interior police. The task of the American officials in introducing this science, new to average Mexicans, sorely tried the patience and temper, but was finally crowned with success. Vaccination against small pox and typhoid was ordered and after employment of sufficient force to secure compliance, every one was treated. An isolation camp and destruction of suspected belongings soon stamped out small pox. Typhoid prophylaxis was administered and no case of typhoid appeared. The typhoid treatment was even more unpopular than vaccination but eventually was given to each member of the camp.

The status of these refugees, while ordinarily that of prisoners of war, was subject to modifications. Eighteen Mexican officers having broken their parole a short time previous at a point along the border, the favor of parole was not extended to any officer at Ft. Bliss.

[The Internment of Mexican Troops in 1914. By Capt. Geo. H. Estes, 20th Inf. *Infantry Jour.*, July-Aug., '15. Continued from May-June issue. 8600 words. Photos.]

Applications for release, based upon the Hague Convention, upon mistaken identity, etc., poured in as soon as it became understood that stay might be prolonged.

Each case was decided upon its merit; women and children were held as an act of charity. Civilians captured with Gen. Mercado were held, also paymasters, musicians, and medical officers. These latter were afterward dismissed, as they could be spared. Pay was not given to these men and officers due to irregularities existing and to be foreseen. Opportunities for private work existed but the Mexicans would not volunteer even for pay.

The ration issued cost finally 17 cents a day, was excellent, plentiful and suited to the Mexicans. American ration at this time cost 24.82 cents at El Paso. Bread, at first from a commercial bakery, was at Fort Wingate supplied by two sections of a Field Bakery Company (6 ovens) operated by student bakers and cooks. Mexicans were later trained to handle two field ovens. Mexican officers were utilized in distributing the ration and to make requisition therefor. Issue was daily to heads of families, messes (of which there were four); the Regulars; the Volunteers; the Hospital; The General Officers; and Staffs.

Great ingenuity was displayed in their cooking arrangements; oil cans, tomato cans, pieces of sheet iron, etc., soon established an efficient kitchen. The sick and wounded were looked after more carefully and were furnished ranges and mess kits. Wood, straw, oil, fuel, candles, matches, etc., were issued.

The average daily cost of camp was $1135, not including depreciation nor pay to U. S. troops. Clothing issues were necessary from the first; charitable persons furnished some, the Mexican Consul some, but the United States soon had to make regular issues as further calls upon Mexican Consul were fruitless. The total value issued was $26,000. A constitutionalist agent kept a small body of constitutionalist soldiers supplied from time to time. The government-issued clothing was carefully packed away generally and the Mexicans wore their rags in returning to Mexico upon their release. Various tents were used, kitchen placed outside. Adobe constructions were encouraged and standardized so as to employ those who would otherwise have been idle. These huts were arranged so as to receive additions as needed. Windows, doors and raised floors, fireplaces and chimneys were constructed. This construction was in its infancy when Mexicans were released and returned. All tentage in use was condemned to prevent its issue to U. S. troops, and was stored for possible future similar contingencies.

Sanitary measures were thorough and were reinforced by the strictest regulations. The Police Officer, with his assistants, was charged with the observance of these regulations. Refuse was burned at the kitchens, obviating garbage cans. Washing places and showers were established. The police officers exercised general supervision over the behavior and conduct of their sections. Incinerators were constructed, built of adobe brick. The heat from the fire box passed over and through the refuse chamber and out the chimney. The heat developed consumed everything in the refuse chamber. Water was from the El Paso city supply and at Ft. Wingate, piped from a large spring. It was ample and excellent. Suspected cases were at once isolated. Smallpox and chickenpox were the only contagious or infectious diseases that appeared. Complete field hospital accommodations were provided inside the stockade. Major surgical operations were allowed to be performed at the Army Hospital at Fort Bliss. It is believed that fully 80 per cent. of those interned were infected with one form or another of venereal disease, which was the cause of the largest percentage, by far, of sickness and disability. Deaths occurred, 101 in all. Those at Ft. Bliss were turned over to Mexican Consul for interment, those at Ft. Wingate were buried with appropriate honors, in the Post Cemetery.

Sanitary measures and police regulations were enforced by means of rewards and punishments. The Mexican provost marshal handled all cases arising between Mexicans. His punishments were subject to approval by the executive officer. Unusual punishments as practised in the Mexican army were of course not tolerated. Serious offenses, such as attempts to escape, bribing or attempting to bribe sentinels, assault and battery, insubordination, refusal to work, and like cases were handled by the executive officer. Punishment followed promptly, as well as reward, and complete record of each case was kept. The presence of the women was the greatest source of trouble. Laxity in the marital relations was prevalent. A permanent detention pen, isolated, was for punishment of those committing serious or repeated offenses. Petty thieving was common. Attempts to escape were frequent and were successful or frustrated, depending at Fort Wingate almost entirely upon weather conditions. Four Mexicans lost their lives in attempting to escape; Navajo Indians trailed and brought back one group. The stockade at Wingate was further strengthened by a second low wire fence, outside the main fence, with wire entanglement between the two. A "dead line fence" 10 feet from the main fence was also constructed. Full and frequent warnings were given on the bulletin board at the head of each of the sixty-six streets. All orders were transmitted in this way and in each street one man, the "Encargado," was held responsible for delivery of orders to the street and for minor regulations.

[Internment of Mexican Troops in 1914 (concluded) by Capt. George H. Estes, 20th Inf. *Infantry Jour.* Sept.-Oct, '15. 8400 words. Photographs.]

At Fort Bliss, sentinels at each corner and at the middle of the long side of the stockade guarded the camp. At night six extra posts and a mounted patrol were added.

The one gate, at which records of those undergoing punishment were kept was permanently in charge of non-commissioned officers. The senior was responsible that only authorized persons and packages passed through. A sentinel was detailed for each eight prisoners. By virtue of a rendered opinion, the interned prisoners were required to perform the labor necessary for their own health and sanitation and whatever was reasonably incident thereto. No compensation was given for work of this class.

Every class of skilled labor was found in the camp. The most important piece of work was a substantial bridge across the Rio Puerco.

Those skilled in handicraft were encouraged to place their work on sale in the camp exchange. Many women were employed as servants, seamstresses, laundresses, etc. Exercise spaces were prepared and though not made to exercise systematically, the Mexicans took to various games readily. Several very creditable field days were held. A very fine band of thirty musicians under an efficient leader was gotten up from the remnants of the three bands surrendered at Ojinaga. At Fort Wingate, the internes built a theater where band concerts, dancing, and vaudeville entertained many.

Thirty-two officers and 117 enlisted men made their escape from the stockade. Tunneling was in general the means employed.

The various classes confined soon became friendly, and Constitutionalists, irregular, and Federal mingled freely in all camp life. Church and school services handled these phases of daily routine, and were very successfully conducted.

MEXICO—Continued

A club for interned officers was established and became an educational as well as a recreative feature. Alcohol was never permitted in camp, and all lights were extinguished at 10.00 p.m.

Camp was augmented from time to time by arrests of Mexicans of all forces. The Federal Government made several ineffectual legal attempts to have its soldiers returned to Mexico. The Constitutionalists were for a time meagerly supplied by their agents in the U. S. About April, 1914, the strained feeling between the U. S. and Mexico, and the presence of the camp so near the border, caused removal to a more peaceful section. The prisoners were entrained and taken under guard to Fort Wingate, New Mexico. The entire equipment of the camp was moved at the same time. Mexicans performed all the labor of striking and repitching camp. The new perimeter was octagonal 4100 feet long, enclosed and guarded in practically the same manner as at Ft. Bliss. The guard at this camp was eight companies of infantry and one troop of cavalry.

In time, steps were taken to release or to return these Mexican internes, since the outlook was unenviable for them and expensive for the United States. The Mexicans were at all times hopeful of release, and made several demands upon the Mexican officer in charge, which amounted to almost mutiny and which were sternly repressed by the American officials.

It was finally decided to liberate officers and their families at Fort Wingate, furnished with railroad transportation not more than that to Eagle Pass. The enlisted men were forwarded to Piedras Negras. The curtain thus fell upon the scene. It had been an expensive performance and bills were paid with little prospect of immediate reimbursement. The duties of the United States were performed with generosity at all times.

The total cost of the camp, transportation, etc., was $740,653.13. It is presumed that eventually a claim in full will be lodged against Mexico.

—Plans for the Invasion of

[Plans for Mexican Invasion. *Army & Navy Register*, June 12, '15. 400 words.]

Conferences on the subject of invasion have been had at the War Department during the past two weeks. Should intervention follow, the most moderate estimate of the number needed runs to 500,000 men, partly to oppose Mexicans under arms totaling 100,000, and partly to hold the country. Any real project in behalf of Mexico would require a special appropriation by Congress in extra session. Operations of one year's duration would call for $800,000,000.

[Advance Into Mexico. *Army & Navy Register*, June 12, '15. 350 words.]

The War Department is considering the probability, however remote, of occupying Mexico, particularly as the latest information indicates a disposition on the part of the Mexicans to resist American measures of rescue and pacification.

MILITARY CROSS (British)

The new British decoration is of silver and is 1⅝ inches square. In the center are the letters G.R.I., and on each arm the imperial crown. The ribbon is of three equal stripes, the center dark purple, the others white. Captains, commissioned officers or warrant officers are eligible for the decoration. The cross does not confer any individual precedence or entitle the holder to any addition after his name as a part of his description or title.

MILITARY EDUCATION

See
EDUCATION—MILITARY
MILITARY SCHOOLS

MILITARY HISTORY

See subhead HISTORY *under names of countries. Also names of specific Wars, Campaigns, Battles, Sieges or other military operations.*

MILITARY LIBRARIES

See
LIBRARIES, MILITARY

MILITARY SCHOOLS

See
SCHOOLS, MILITARY

MILITARY SURGERY

See
SURGERY, MILITARY

MILITARY TOPOGRAPHY

See
TOPOGRAPHY, MILITARY

MILITARY VOCABULARY

See
VOCABULARY, MILITARY

MILITIA

[Militias. By Jose Paulo Fernandes, Captain of Artillery. *Revista de Artilharia*, Sept., '15. 3200 words.]

At present in almost every country of the world the idea is to train as many men as possible in as short a time as possible. The term of two years active service is generally adopted, but it is recognized that this time is too short. The consensus of opinion seems to be that the proper time to begin military training is during the boy's preparatory school years. In any event, this service to be rendered before the young man is incorporated in the first line.

The permanent or standing armies contain only a small percentage of the effectives that have been trained. The permanent establishments are little more than the skeleton on which the reserves and volunteers are formed.

It is necessary that the youth of the country be impressed with the fact that they owe a duty of service to the country, and with them rests the first defense. They must be taught that a good soldier is one who is well trained and disciplined.

In the present war the large forces were called together and put into the field with order and regularity in a short time because of the training which they received in time of peace.

The organization of the first line of mobile troops is on the principle that those troops which have received the most recent training are most fit. They would naturally be in the most robust health, and could make the most vigorous advance or put up the most determined resistance.

Because of the employment by Germany of troops in the most perfect health and with the best of training she was enabled to strike hard. Germany began the war with 872,000 men of her regular establishment, with two millions in the reserve, and with two millions in the Landwehr and Landsturm, or almost five million men with a maximum age of 45 years.

Three fifths of this force was available and employed on the front. The remainder was utilized to guard communications and occupy permanent fortifications.

It has been calculated that Germany lost seven men per minute during the first seven months of the war.

Austria-Hungary employed at the beginning of the war some 4,320,000 men.

At the beginning of the war the Anglo-French-Belgian force was less than that of the Germans. The tactics pursued by Joffre have been active, firm, calm and confident. He moderated the natural impulses of the French soldiers, and taught them to proceed with caution and prudence.

The indisputable advantages of the militia system over that of large standing armies is one of economy. The militia is the reserve, and the great battles of the past 40 years have been won by reserves. The Serbian troops which are putting up the wonderful fight of the year are militia soldiers.

The conflict at present proves that the militia armies have the courage as well as the resistance of the armies that were entirely professional in the past. The day will arrive when the decisive actions will be fought and won by militia armies.

[Other Militias than Ours. By G. N. Tricoche. *National Guard Mag.* Oct, '15. 1800 words.]

The term *militia* conveys variously the idea of non-permanence of service, voluntary service, or a service of length less than that in the Regular Army. Brief service is perhaps the most distinguishing characteristic, and we will here consider as militia men who serve one year or less. This brings under consideration Canada, Australia, Switzerland, Norway, Denmark, and Belgium.

Canada has a militia system much like our own, with the same peculiarities and defects,—among the latter too few opportunities for field service, firing practice, co-operation between the different arms, and lack of reserves. The Canadian militia required six months additional training to fit it for service in the present war. One feature differs markedly from ours. There is a permanent corps of officers, non-commissioned officers, and men numbering 2,844, who serve as model units and instructors for the militia.

Compulsory service is frequently found in connection with militia as in Argentine and Australia. The latter is remarkable as the only Anglo-Saxon country to adopt compulsory service in time of peace.

Militia may be used as an adjunct to a regular army, as in England, Rumania, and Belgium. In these countries, the militia is a second line force, and its importance varies with the strength of the first line force.

In Belgium, the Civic Guard is a police force in time of peace, and can be used as a territorial force in time of war. Service in the English Territorials is voluntary. Forty one-hour drills are required the first year, and ten each succeeding year, with 8 to 15 days annually in camp. In Rumania, the militia is a reserve incorporated into the regular army on mobilization.

The more interesting are the countries whose sole force is militia. It may be remarked that the burden of service falls unequally even in these countries, as the service is much longer in the technical branches. In Switzerland, Hospital Corps men serve 60 days, while the cavalry serves 3 months. In Denmark, cavalrymen serve 102 days, and supply corps men only 18. In Denmark the artillery drivers serve a full year, and the coast artillerymen one year and five days. In Sweden, some branches serve almost a year, while in Norway the longest service is in the cavalry—102 days. In Australia, the service is 16 to 23 days the first year, 16 days the next, and 8 days annually thereafter.

The best type of militia is found in Switzerland. The service is not so long,—60 to 90 days the first year, and about two weeks annually for seven or eight years,—but this is rendered effective by the earnestness and thoroughness with which the instruction is carried out.

There is an elaborate system of courses for specialists of all kinds. Non-commissioned officers are required to study at home. A 2nd lieutenant of artillery serves 215 days before getting his commission. Notwithstanding the extra work, the grades of officer and n.c.o. are eagerly sought. Each man keeps his equipment at home. The mobilization of 1914 worked without a hitch.

All countries depending wholly upon militia face two serious difficulties,—the supply of officers and non-commissioned officers, and the training of specialists. The most practical way to solve the first problems is to keep a permanent body of officers and non-commissioned officers. In Norway for a peace strength of 35,000 men there are over 800 officers and about 2700 non-commissioned officers who are professional. The Swiss, on the other hand have only 219 officers and 47 non-commissioned officers as permanent instructors.

United States

See also
National Guard (U. S.)

MILITIA—Continued

—Instruction and Training

See also

AERONAUTICS—INSTRUCTION AND TRAINING —MILITIA

DISCIPLINE

FIELD ARTILLERY—INSTRUCTION AND TRAINING

VOLUNTEERS OR MILITIA

"MINENWERFER"

See

FIELD ARTILLERY — SMALL VELOCITY ORDNANCE—GERMANY

MINES

[The German Naval Offensive and Defensive Mine. By 1st Lieut. Oscar C. Warner, Coast Artillery Corps, U. S. Army. *Jour. U. S. Artill.*, May-June, '15. 900 words. Illus.]

The conspicuous features of this mine are:

1. Mooring rope reel on the mine.
2. Primary battery in an inactive condition inside the mine.
3. Battery electrolyte in a sealed glass bottle.

The buoyant mine is attached to the anchor by a device locked with a salammoniac plug. Mine and anchor are planted together and both sink to the bottom. When the salammoniac plug dissolves, the mine is released from the anchor and slowly rises until the decrease in hydrostatic pressure causes a submergence regulator to act, and the mine is clamped to the mooring rope at a submergence of about ten feet. A part of the firing circuit is closed at the same time.

Firing is by electricity and is done by a passing vessel striking one or more contact fingers which project through the mine case. A blow on any of the fingers breaks the bottle holding the electrolyte and the primary battery is energized.

When the tension on the mooring rope is removed, the device which clamps the mine to the rope is released and the firing circuit is opened.

To provide for safety in raising the mines each anchor is connected to the next by a tripping cable. A pull on the tripping cable releases a bight in the mooring rope, allows the mine to rise to the surface and renders it harmless. As an additional safety precaution, a loop of wire in the firing circuit is placed in a convenient location outside the mine case where it can be cut before the mine is taken from the water.

—Coast Defense—Record Forms

[Forms for Records of Mine Planting. *Jour. U. S. Artill.*, May-June, '15. 1000 words. Blank forms.]

When planting mines either for instruction or service, it is desirable that there be kept a full and complete record of each operation. Separate records should be kept for each storeroom, loading room, casemate, and planter. Where more than one mine company is working, the operations in each of these places are continuous and more or less independent. Therefore it often is neither practicable nor desirable to use, for example, all the anchors assembled in sequence and no others in a particular group of mines.

The following method of keeping these records is suggested by Capt. F. Q. C. Gardner, C. A. C.:

Issue to each storeroom, loading room, and planter a note book of the type regularly issued for this purpose.

Each anchor and mine as assembled is given a serial number, and the data called for recorded as each is assembled.

Upon completion of the work for the day, the planting officer or the commander of the mine planter, collects all note books, and tabulates in his own book the data desired, corresponding to the serial number of the mine and anchor used, these serial numbers having been noted on board the planter when the mine and anchor were assembled for planting.

—In Coast Defense

See

COAST DEFENSE—BY MINES

MOBILITY

See

SUPPLY AND TRANSPORT — DEPENDENCE OF MOBILITY UPON

MOBILIZATION

See also

PREPAREDNESS FOR WAR

—Preparation for

[Preparations for Mobilization. By Captain Arthur Maillard, Chilean Army. *Memo. del Ejército* (Chile). July, '15. 800 words.]

All details of mobilization in so far as they depend upon the troops should be made ready in time of peace. Schedules should be prepared indicating the steps to be taken from day to day after the order for mobilization is issued and a battalion from each regiment should be mobilized annually, the units being brought up to war strength by necessary additions from the remainder of the regiment. When mobilized, the battalion should make a short march or be required to embark or disembark.

MONS, Battle of

[General Joffre's Task. Anonymous. *Canadian Military Gazette*, Apr 27, '15. 250 words.]

In an interview, Gen. Joffre is quoted as saying that at the Battle of Mons, the Allies were numerically equal to the Germans, and that the action was lost through faults of command. The weakness of some of these commanders was known before the war, but there was not time to change. Few had had any experience in war, and none in large operations. Those who did not answer to the requirements were replaced by younger men.

[The Retreat From Mons. Anonymous. *Canadian Military Gazette*, May 11, '15. 400 words.]

The action of the 25,000 British troops under Maj. Gen. Rawlinson deserves a better name than the "Retreat from Mons." Faced by overwhelming numbers, they fought valiantly, losing 60% of their total strength. Included in their operations was a forced

march of 28 miles made at night after fighting and retreating all day.

MONTENEGRO

—History

See also

EUROPEAN WAR

MORALE

See also

DISCIPLINE
PSYCHOLOGY OF COMBAT
RESIGNATION (OF ARMY OFFICERS)
WAR—AESTHETICS OF
WAR—MORAL FORCES IN

MORTARS

See also

ARTILLERY—FIRE—HIGH ANGLE
COAST ARTILLERY
FIELD ARTILLERY—MATERIEL—MORTARS AND HOWITZERS

MOTOR TRANSPORT

See also

AUTOMOBILES
SUPPLY AND TRANSPORT

Australia

[Mechanical Transport with regard to Australia. By Lieut. H. F. Cohen, A.E. *Australian Military Jour.* Jan., 1915. 1300 words, photos., tables.]

Motor vehicles are of even greater importance in Australia than elsewhere. In event of war, the existing high roads, few in number, will have to be used for communication, since adequate railways are lacking. Road space therefore must be economized through use of motor vehicles.

The scattered settlements of Australia require this method of transportation for economic reasons also. The supply of water, fuel and rations required per given distance is very much less for motor than other transport. Every advantage of motor transport, such as economy of horses, drivers, road space, fuel, weight, greater distance, faster pace, useful load, etc., presents itself more forcibly in Australia than in the ordinary commonwealth. Motors are also adaptable for outside use such as supplying electricity for searchlights, illuminating camps, etc. All the Powers have adopted this mechanical transport for their government service.

Great Britain, France, Germany, Austria, and Australia subsidize suitable private motors. For details see article on Motor Vehicles in *Army Review,* Oct. 1913.

The registration of all licensed motor drivers of training age is required, and they must be enrolled as a reserve.

Motor trade has rapidly increased in Australia and there exists but little doubt as to the suitability of the present force for the transportation of supplies and ammunition of our home force. The organization of the private vehicles into a reserve can be now advantageously undertaken.

United States

[An Army Auto Reserve Corps. *Army and Navy Register.* Oct 9, '15. 670 words.]

The favor shown by the Secretary of War to the formation of an auto reserve corps is not shared by all, for the reason that a list of owners with classification of their vehicles, however accurate at the epoch of its establishment would be worthless in three months. It will be much better for the War Department on the outbreak of war to appropriate such vehicles as it may need. The Secretary is quoted (from *Motor Print,*) as recommending that owners of Country Clubs and grounds convert these into impromptu training camps, and keep the Department informed as to the readiness of members to offer their cars and service as drivers, in case of war. Cars of one and the same make should be assembled in one unit of ammunition train, supply column, or sanitary train. The subject is under study by the General Staff.

[Motor Truck Transportation. Editorial. *Army & Navy Jour.*, Nov. 20, '15. 500 words.]

The purchase of 27 motor trucks and one supply truck will be recommended to Congress. These will form a motor truck company for use in Hawaii, where road conditions are similar to those in Europe. In the U. S., dependence will still be placed mainly on the mule, particularly for transportation near the front. Motor trucks seem to have solved the transportation problem in the Marine Corps. Animals cannot be transported aboard naval vessels, so the Marine Corps must rely upon motor vehicles or upon impressed vehicles. The latter are ineffective. Two motor trucks seized in Vera Cruz were of more use than all other seized vehicles put together.

Russia

[Special Power Trucks in Use in the Russian Army. By Capt. von Polster. *Kriegstechnische Zeitschrift,* Jan-Feb, '15. 1500 words. 7 photos.]

Russia has, in late years, found herself forced to devote considerable attention to the development of power trucks as an adjunct to the army. Possessing only one automobile factory worthy of the name, she has purchased largely from abroad. In 1912 the number of army trucks was increased from 50 to 500. As the number of machines possessed by the civilian population is very small, her potential strength in this respect is much less than that of other European countries.

One type of truck of special interest is a repair wagon designed for making slight repairs on automobiles and air craft. The equipment is mounted on a ¾-ton, 30 horse power truck. This equipment consists of: a direct current generator; an electrically driven lathe; a shaper with individual drive; a wood band-saw driven by hand, foot or motor power; a sensitive power drill; a small foot power drill; a portable forge and anvil; a carpenter's bench; an acetylene-hydrogen welding outfit; and a motor-driven emery wheel. The generator is belt-driven from the gasoline motor of the truck. The total weight of machine and equipment is 15,000 pounds.

MOTOR TRANSPORT—Continued

Another special type of truck accompanies the flying corps. To this machine a trailer is attached. The truck itself is of the ordinary commercial type. The trailer is so constructed that even the largest air machines can be run into it without disassembling any part except the planes. Its inside length is 295 inches and width 90 inches. The wagon bed is very low in order to facilitate the loading of air craft. The weight of the trailer with its two wheels is about 2500 lbs.

Russia has closely copied the best type of automobile ambulances in use by other European countries. It is believed, however, that she is the first nation to adopt an automobile field kitchen. It is constructed on a 2 ton, 30 h.p. truck and is equipped to serve a single meal for 500 men. The body is divided lengthwise by a passageway on either side of which are the food containers. These consist of two tureens holding about 50 gallons each and two square boilers for tea or coffee with a total capacity of 40 gallons. Some of these kitchen trucks have a trailer as well.

—Of Artillery

See

FIELD ARTILLERY—MOTOR TRANSPORT

—Of Troops

[Transporting a Regiment by Motor. *Army and Navy Jour.* Oct 2, '15. 700 words.]

(Gives an account of the transportation of the 7th Infantry, N. G. N. Y., by motor vehicles from its armory at 67th St. and Park Avenue to Van Cortlandt Park. Time of transit not stated. Time of loading, 13 minutes. Thirty-five touring cars and thirty-five motor trucks were used.)

—Use of in European War

[Motor Transport at the Front. Anonymous and "Eye Witness." *The Sphere.* Apr. 17, 1915. 500 words. Illus.]

The immensity of the motor transport service with the British army on the Continent is indicated by the fact that there are over 20,000 men in the mechanical transport section of the Army Service Corps. The motor transport service furnishes the link between rail head and horse-drawn vehicles used in distribution, and enables rail head to be kept at a safe distance in rear. Motor transport is used in trains of about 30 lorries keeping station 30 yds. apart in column. The traffic system is controlled by motor cycle dispatch riders. The motor vehicles are used on occasion to transport men. Motor kitchens and bath houses are being used. The "first line transport," horse- or mule-drawn, is used to carry the supplies immediately required by the troops, and this goes permanently with them. Some pack transport is also used. All other transport from rail head to refilling stations is by motor vehicles.

[Mechanical Transport with the Australian Imperial Force. *Australian Mil. Jour.*, Apr., '15. 2500 words. Photos.]

Australian troops abroad are furnished with 135 motor lorries, all collected and equipped in Australia.

Six of these are fitted out as repair shops, having timber bodies 12 x 7 feet inside. Each is equipped with 6" lathe, 14" vertical drill, electrical drill, forge, anvil, bench, vises, etc., and an .8 k. w. generator. When the car is stationary, the sides and back open out and become platforms supported by legs on the outer edges. A belt and pulley attached to the engine transmit power to the machines. The electric generator lights the car and can furnish light for field hospitals, etc.

Weight of each shop, equipped, about 10 tons. A two-wheeled trailer is attached to each.

[Automobile Transportation in the French Army. *Memorial de Ingenieros del Ejército.* May, '15. 150 words.]

The French army is now using about 15,000 high-speed automobiles and 12,000 heavy trucks for supply and troop transportation. General Gallieni first made extensive use of auto transportation, employing 4,000 taxis in his sally from Paris on the German flank, moving 70,000 men 65 kilometers in six hours; and since then this method of transportation has been used frequently in quick movements, notably in transporting 200,000 men of the English army from Braisne, between Soissons and Rheims, to Saint Omar, 315 kilometers, in three days.

[Motor Vehicles in European War. *Army & Navy Register.* May 29, 1915. 1000 words.]

The petrol-driven vehicles now serving the British Army in France are counted by thousands: they vary in carrying capacity from a few hundredweight to several tons. Parks and depots are organized in the rear of the army for the issue of vehicles, and their repair when injured. The mechanical transport depots are of two classes, advanced and base, the former of the nature of retail shops, the latter points at which extensive repairs and overhauls are possible.

[Mobility in Modern Warfare. Note. *Scientific American*, May 29, '15. 250 words. Illus.]

Photographs are reproduced showing an enormous gasoline tractor used in Poland to supplement poor transportation facilities, armored cars used in Flanders, and a German bathing train consisting of a tank car of 2300 gallons capacity, three cars fitted for hot baths, and several compartment cars.

[In the Petrol World. *Sphere,* June 5, '15. Photo.]

From the photograph reproduced, it appears that the Daimler Company has delivered regularly to the British Government each week twenty-five motor lorries. There has been no failure in these deliveries since the war began.

[Use of Automobiles in the War. By Colonel Juan Avilés, Spanish Engineers, *La Guerra Europea,* July 9, '15. 1000 words.]

Before the organizing, by the principal powers, of the service of volunteer automobilists—which was the most efficacious way of

putting in the hands of the military authorities all the existing resources of that nature in a nation—it was thought that the proper place for automobiles was in the line of communications and in the headquarters service. It was not considered likely that troops would make of them a use analogous to that of the railroads.

Beginning with the first phase of the campaign in Belgium, the Germans used automobiles for reconnaissance and the occupation of important points weakly defended. Their use developed to the point of relying on them for the rapid transportation of reserves to the places where they were needed.

The first application on a grand scale of automobiles to accelerate large movements of troops is due to the French. The assembling of General Maunoury's army on the flank of the German right wing, in the early days of September, was accomplished before the Germans though it possible, thanks to several hundred requisitioned automobiles.

The Germans have used them in East Prussia and Galicia to harass the retreating enemy. This explains the fact that the Prussian Guard fought, in the brief period of 8 or 10 days, at points separated by about 200 kilometers.

One great advantage is that the soldier arrives at the point of combat rested and refreshed.

Hardly a year ago, heavy automobiles were considered of most value to the army, but now light ones seem even more valuable. The army inferior in numbers needs to make up for that deficiency by rapidity in the transmission of orders and in the movements of troops, in reconnaissance, in inspection of the services and in the evacuation of the wounded and sick, in ammunition supply, and in visits to the different points of each sector.

[Power Traction in War. By the Right Hon. Sir John Macdonald, K. C. B., *Jour. Royal United Service Institution.* Aug. '15. 5000 words.]

It is true that for very long distances the railroad may be the most expeditious and efficient means of moving troops. But it may be reasonably argued that this does not necessarily apply to shorter distances—say, of 100 miles or under—and certainly does not apply to rapid emergency calls for troops at a particular spot, and their movement without warning to the enemy. In the first place there must be a line of railway available; next, there must be an organization of railway stock and engine power at the spot most convenient, trains must be marshalled, the line must be cleared, the troops entrained in bulk.

Again, the expedition cannot, in all likelihood be delivered at a railhead which is most advantageous in the special circumstances. The spot where the troops are necessary may be many miles away from the station at which the transit by rail must end. Long marches in a lateral direction may be required, and thus much time be lost and exposure and risk to troops moving to a flank caused, and the troops may arrive too late, or be exhausted. Again, the movement is practically sure to be known to the enemy. He can learn the number of trains and troops being brought forward. He can raid the line, the force going forward can not deviate.

If the service of auto cars is available, the journey can begin at speed at once. The cars start from the barracks or camp where the troops are all the time. Usually several roads would be available. Troops can be easily deviated.

Further, the eggs are in many baskets, while with trains they are in a few or a single one.

The railroad is a very good friend and much to be prized; but it has its weaknesses, which it is a part of the enemy's greatest efforts to accentuate. We see in the present war its value to our enemy, in the facility it affords for moving troops over very long distances from and to the different fronts. On the other hand, we see how the carefully worked out system of strategic railways, running parallel with the lines of attack, gives the enemy advantage, and how that advantage is lost in degree when by pushing forward into his opponent's territory he leaves these valuable aids in the rear.

This has been illustrated on the Eastern front of the war zone. Retreat by the Russians reduced the facility of operations by their enemies in a marked degree.

On the other hand, the possibilities of rapid road transit of troops have been demonstrated in the present war. It is good business to commandeer thousands of vehicles for conveying soldiery. When the Germans were pushing their way northwards to outflank the left of the allies, and so make an opening for the march on Calais, a whole British brigade was taken up by motor omnibuses and carried rapidly northwards, thus barring the way, so that for eight months the capture of Calais has not been brought an inch nearer by the attacking force.

The greatest demonstration of the value of the power-vehicle for troop transport was given when General Joffre, having resolved to turn at the Marne, made his great main forcing stroke by suddenly bringing to the front a large body of troops from the Paris garrison. On a certain night all taxicabs in Paris were requisitioned to assemble at an early hour at various rendezvous. In a very few hours a great force reached the firing line, doubtless by several roads, bringing aggressive strength to stem the tide. It was a brilliant French coup and stamped the auto-car once for all as a most valuable aid to a staff organizing a rapid concentration of troops.

The Germans too have realized the value of motor transit and have used it on a large scale, and the Allies have now an enormous fleet of power vehicles, ready at a moment's notice to move large bodies of troops in any required direction.

As regards transport, who can doubt that the admirable manner in which our troops have been fed, both in sufficiency and regularity, is due in a great measure to the facilities provided by a vehicle that can run at speed, that

MOTOR TRANSPORT—Continued

has no need for rest to feed, or indeed for rest at all?

The motor services hitherto spoken of may be called non-combatant services. But the motor vehicle is also to be found within the zone of fire, giving valuable assistance in the actual combat. General and Staff officers can be conveyed with three time the speed of a horse from one point of the battlefield to another, and with less fatigue than is caused by riding. Orders are also conveyed over great distances of the firing line by motorcyclists.

It has been possible to organize movable forts, by armor-plated auto-cars, which carry one or more machine guns and rifles, and these are found most effective in covering an advance, or a retreat, or assisting in maintaining a body of troops by raking the enemy on a flank. They are effective in many ways and no force can now do without their aid. The motor-bicycle with side car is also proving itself a highly useful aid, a machine gun being carried behind a steel shield. Very bold raids can be made with such vehicles, which can use high speed both in advance and in retreating, therefore holding on longer at a point, aiding an advance or covering a withdrawal.

The power vehicle is also in regular use for conveying the heavy ordnance now employed. The modern fight being essentially of a siege character, the siege guns must advance or retire with the attacking troops, and the power of the petrol motors to move heavy guns is of great value. By the aid of large wheels, with a series of hinged discs around the rim, very powerful work can be done, and by an ingenious device, a vehicle can be taken over soft ground, and mounds or hillocks. The device consists in coupling the back and front wheels together—in this case of the same size, of course—the chain engaging in sprockets on the rim of the wheels. Thus the driving power is applied to both wheels. On the outside of the chain are a succession of broad discs, which may be compared to feet, and which support the vehicle by their broad surfaces extending below the wheels and along the chain when it is between the wheels, thus the pedrail, as it is called, prevents sinking in soft mud, and skidding. On account of its appearance it is called the "Caterpillar." It is of the greatest importance; each taking the place of 20 horses or oxen, goes at higher speed many places where oxen or horses could not be used.

Whether the limit of the adaptability of the power vehicle for war has been reached, or whether there are greater developments to come, there can be no doubt that already its services have proved of immense value, and that no combatant could hold the field without it.

It is now a necessary and efficient part of military equipment.

[Motor Trucks and Modern Warfare. By Joseph Brinker. *Scientific American*, Nov. 6, '15. 2600 words. Illustrated.]

Armies of to-day are largely dependent upon motor trucks for their supplies. 500 Paris motor busses, transformed into meat wagons by boarding over their windows, supply fresh meat daily to 750,000 men. Each bus carries about 4000 lbs. of meat. 250 busses would theoretically do the work, but the others are kept in service to assure regular supply.

Few breakdowns have occurred, because they are run by their regular drivers and are employed in convoys with no other type of vehicle.

When war broke out, each bus completed the trip that it was on at the time the mobilization notice was posted, and then reported at the designated place for army service.

Various types of motor vehicles have been employed. Light cars with light armor were employed in the fighting in Belgium. The extreme of this type was the German car weighing 8 to 10 tons, and carrying guns and heavy armor. These cars were effective on good roads but lost their usefulness on the second class roads after rain and frost came. Two new types have been evolved. The first is a powerful touring car or 2-ton truck armored all over but kept to the minimum weight; the second is a four-wheel-driven truck capable of being driven equally well in both directions.

Motor vehicles have also rendered important services as auxiliaries to the aeroplane service. Aeroplanes were organized into divisions of seven or eight machines of the same type. Automobiles furnished the power to tow these machines about, the wings being folded back for movement. They could thus retreat quickly when in danger of capture. The auxiliary automobiles carried spare parts and served as repair shops. Dark green tarpaulins were used to cover both aeroplane and automobile. Under trees, this furnished effective concealment.

Both trucks and passenger cars have been used as ambulances. Closed body trucks used in hauling supplies to the front also carried wounded to the rear.

About 15,000 American trucks had been sent abroad to July 1, 1915. Of these 2990 were sent in June. The belligerents had available 100,000 trucks at the beginning of the war, and have manufactured 5000 since, giving a total of 130,000 motor trucks in service. 23,000 automobiles of other types have also been sent abroad.

All the belligerents except Russia subsidized motor trucks. France established truck subsidies in 1906, and was thus enabled to influence design so that trucks suitable for the military service were developed. England subsidized trucks in 1912, but types had already been developed along strictly commercial lines. Thus the French motor transport at the beginning of war was far more effective than the British. Germany and Austria began subsidizing motor trucks in 1913.

French subsidies total about $1400 for each truck in four years, and the subsidies aggregated about $750,000 in 1913. British subsidies aggregate $525 to $575 for each truck in three years.

The German subsidies favor trucks capable

of hauling trailers. Subsidies on a single truck aggregate $1190 in four years. If the truck is capable of hauling one or more trailers, the total subsidy is $1854 in four years. In March, 1913, there were about 1225 German motor trucks receiving subsidies. The Austrian subsidy follows closely that of Germany. The average subsidy is $1725 extending over 5 years, Russia gives no subsidy, but she had several hundred French four-wheel-driven tractors in service. Italy has spent several million dollars for motor vehicles since 1909. The average value of the 130,000 trucks in use is about $2500 each.

See also

European war (Article: "Scientific and Engineering Aspects of the War")

MOTORS

See also

Aeronautics—Motors

MOUNTAIN ARTILLERY

[Approximate Formulæ for the 65-mm. Mountain Gun. Maj. Roberto Segre, Italian Artillery. *Revista di Artiglieria e Genio,* Apr, '15. 600 words. 1 table.]

(A series of ingenious formulæ, giving approximate values, for mental calculation, of angles of elevation and fall, striking energy, and 50% zone, for the Italian mountain gun, for any range.)

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[Pack Artillery in Campaign. By 2d Lt. A. G. Thomason, 4th F. A. *Field Artillery Jour.* Apr.-June, '15. 1500 words.]

Pack artillery usually operates in mountainous country, but it is also adapted for close support of the infantry. For the latter purpose, it must be self-reliant or otherwise it will act as a drag on the infantry. Machine guns ought to be assigned to pack artillery. Examples from the Russo-Japanese war show the great advantages enjoyed by the Japanese in having 162 mountain guns and the handicap of the Russians who had none. Pack artillery can not be expected to combat artillery of greater power. It is indispensable in difficult and close country, and also on the defense where its mobility permits it to be moved quickly from one place to another. It is also of advantage to a landing force.

See also

Mountain warfare

Austria

[Garrisons of Mountain Artillery in Austria. By Capt. Marcial Urrutia. ***Memorial del Estado Mayor del Ejército de Chile.*** Mar. 1, 1915. 4000 words.]

Precautions for the march over ground covered by snow and ice:

Careful handling of horses over this kind of ground is always a requisite, and the precautions taken are based on the experience of the mountain artillery of the Austrian Army. Frequently the men proceed dismounted, and on such occasions are generally provided with an Alpine stick. On the Italian frontier the artillerymen are not issued such a stick, but are allowed to use improvised ones, though the infantry are so provided by the issue of a stick of regulation pattern.

In the maneuvering of the Austrian troops the officers, even those of high rank, move dismounted through snow and ice, frequently for hours at a time. In addition to relieving the horses, this affords them an opportunity to follow the men into places inaccessible to horses. Some of the officers are mounted on a special class of hardy, small horse, somewhat like the Chilean pony, but stronger.

Pack animals are especially carefully watched. All sorts of devices are used for safety, and at times the packs are unloaded, and the animals and loads pulled up or lowered by ropes.

In Tyrol the trails are recognized and followed by marked trees and sign posts. They are carefully mapped, and these maps may be purchased in open market.

When the temperature is low the horses of a battery in position are usually kept moving in rear instead of standing under shelter, as it is considered that less danger results from a slight exposure to the enemy than from a continued exposure to cold by remaining still.

Packing, clothing, equipment, etc.:

The drivers and cannoneers carry the Mannlicher carbine and a machete, and although the period of service is three years with the colors and additional periods as reservists, but little instruction is given in the manipulation of the carbine. This arm is used for garrison service and guard duty around arsenals and storehouses. The equipment consists of a light roll, a belt with the machete and cartridge box, and a mess outfit carried on the person and some heavier baggage on mule packs. The artillery carry no haversack, and therefore the weight and inconvenience of the carbine does not bother them. In Chile, instead of the carbine, the pistol seems better adapted to suit conditions. In the Austrian service the officers and some of the sergeants carry revolvers and field-glasses.

Certain men of the battery are assigned patrol duty. They do not make great use of the written message, but locate the battery commander's station before leaving, and communicate by flag or other signals, which all of the officers and non-commissioned officers are skilled in reading and sending.

Baggage carried on pack animals is generally in strong wicker baskets or some similar package, light and strong.

For marching dismounted, the men wear, instead of socks or stockings, a white cloth wrapped around the feet. The shoes are heavy, with buckles or hooks and eyes in front, heavy soles shod with nails, and an iron cover over the heel. The high boot is not used in mild weather. The officers use the same shoe, with a leather legging fastened with a strap. Mounted officers use this combination with a small straight spur with a smooth rowel. For winter the same heavy shoe is provided, but with a fur lining. In extremely cold weather officers use a thick woolen boot and overshoes. The troops wear the overcoat in cold weather, and while marching button back the lower corners of

MOUNTAIN ARTILLERY—Continued

the flaps in front. Artillery soldiers have heavy dark leather gloves, and for those who can afford the expense, permission is given to wear the same type of glove with fur lining. The officers have this type of glove, of better quality.

—Howitzers

[Mountain Howitzer Batteries. By Capt. Targa Spartaco, Artillery. *Rivista di Artiglieria e Genio,* Mar '15. 3500 words.]

The trajectories of modern guns are so flat that it is difficult to find suitable masked positions for them in mountainous country, and it is often impossible for them to reach defiladed targets. Makeshifts for using a gun as a howitzer are always makeshifts, and unsatisfactory. The mountain artillery needs a howitzer as well as a gun, especially as the former is better able to cope with fortifications, which will sometimes be encountered.

In designing such a piece, it should be remembered that a mule can carry more weight in two side loads than in one top load. This suggests that the Deport split-trail carriage may be found to have advantages in transport as well as in action.

Weight must be strictly limited, for if a gun is divided into too many loads the column becomes very long, and the danger of losing part of it increases. And ammunition supply is difficult at best, so projectile weights should be kept down.

Fairly satisfactory mountain howitzers of about 100 mm. caliber, carrying projectiles of 12 to 14 kg., are made by a number of firms. The problem of design and construction may be considered solved; which is of importance to us, since our conditions require true mountain equipment, designed primarily for pack transport. A piece of this character can be carried on eight mules.

So many animals being required, it is suggested that the number of pieces in a battery be reduced to three. Further reduction to two is not recommended, as a mountain battery is very liable to have a gun out of action on account of loss of mules. A three-gun battery with 96 rounds per gun would require 60 mules; a combat train of 36 pack and 36 draft mules could carry 96 rounds per gun on packs and 200 on carts. The field train should be partly pack and partly wheel, and would require 60 animals; total, about 190. The number of men should be 350.

It has been proposed to keep this matériel at frontier forts, but not to organize permanent batteries. This idea is believed to be neither practicable nor desirable.

MOUNTAIN WARFARE

[Mountain Warfare. By Lieut. W. T. Yates, 71st Infantry. *Australian Military Jour.* Jan. 1915. 2900 words.]

A study of manœuvres in the hills of India. The first difference between ordinary and mountain warfare is the necessity for absolute uniformity of detail in the latter.

Mountain warfare includes:

1. The picketing of heights and the withdrawal of pickets.
2. Hill fighting.
3. Perimeter camps and bivouacs.

Mountain tactics differ from ordinary tactics in the following points:

1. Heights along the line of march use pickets in lieu of a flank guard.
2. Exceptional opportunities are offered for the use of cover fire.
3. Transport is much more difficult.
4. Camps are placed in defensive positions, as opposed to all other considerations.
5. Strong pickets are used instead of an outpost line.

The troops designated for picket duty are assigned to the advance guard commander, but form no part of the advance guard.

From four to 25 rifles will meet all requirements. The picket is posted on commanding points, although at times side ravines must be picketed to prevent the enemy from collecting in them. A sentry is posted at the point where the picket leaves the road. The use of "Picket slips" for this road sentry, giving strength, organization and name of commander of each picket (N.C.O.) facilitates efficient supervision. The rearguard commander is responsible for the safe withdrawal of pickets. A distinguishing flag, authorized for the main body of the advance guard, is shown only when required to bring in a picket. Supports, if needed to cover withdrawal of a picket, should be furnished by the rear guard. Pickets of 3 to 6 men under natural cover are tactically stronger than when crowded together in one position.

Although the principles of hill fighting are well known, their application requires special resources, due to difficulties of the terrain.

In hill fighting, the tactics differ considerably. For rough country, the transport of field guns and heavy material is impossible. If too rough to carry light mountain guns, then the rifle is used at greatly increased ranges. Covering fire is an outstanding feature of hill fighting and is always necessary in an attack or a withdrawal. Machine guns furnish the best covering fire, either by bursts or by traversing the hostile line. The enemy cannot generally be enfiladed. Prominent features are always occupied. Absolute accuracy in range is necessary since the beaten zone is much decreased. Assaults must be accurately timed. The Company Commander's responsibility is at its maximum in this warfare.

Camps and bivouacs are compact, with self-supporting pickets holding the commanding ground. The most favored form of perimeter camp, always necessary against an uncivilized enemy, consists of a trench 7 feet by 1 foot, with outer ditch 4 feet deep by 4 feet wide at top, and 1 foot at bottom, earth going into the parapet. Machine gun emplacements at each corner secure enfilade of the ditch. Obstacles are constructed if time permits.

A trip-wire, 6 to 8 inches off ground, stretched taut at about 50 yards in front of position, is vitally necessary. It should have bells or tin rattles, so as to give prompt warning. A field of fire must be prepared, three-fourths of the command is in the trench,

one-fourth in reserve, also dug in. Noncombatants are placed in the center under their own guards.

See also

MOUNTAIN ARTILLERY

MUNITIONS

See also

AMMUNITION
ARMAMENT
COTTON
POWDER

Germany

[The Mobilization of War Raw Materials in Germany. *Scient. Amer.*, July 10, '15. 1200 words. Reprint from *London Engineer.*]

A representative of the German Ministry for War is quoted as having said to the Budget Commission of the Reichstag on March 15 that the conduct of the war could not be prejudiced by the lack of raw material for munitions.

The chemical industry of Germany has been confronted with many new problems as a result of the war, especially in providing substitutes for many materials cut off from import. The government has lent its financial aid and encouragement to these problems, and private factories are not only aided in providing substitute materials, but in readjusting their sale of output and finding local markets to replace foreign buyers.

Although having made preparation in the matter of heavy guns, small arms, and ammunition, the Germans admit that the outbreak of the war found them unprepared in their stock of raw material. In the middle of August of last year a Raw Material Division was formed to regulate the consumption, prevent waste, and secure proper distribution. By the end of August there had been tabulated a statement of all raw material in the country, and although the government nominally took possession of the stocks, sixteen central companies were formed to undertake the collection and distribution. The results have been remarkable. It is declared that no danger exists of a shortage of copper, due to a substitution of other metals in the industries wherever possible. Likewise in chemical products, by new processes and substitutions, the supply is declared adequate. Large quantities of copper, zinc, nickel, graphite, and ferro-manganese are reported to have been seized in Belgium, France, and Russian Poland. Important stocks of nitrate were found in Antwerp, Ostend, and Bruges, together with large quantities of rubber, wool, cotton, flax, hemp, yarn, hides and leather, and these are being shipped daily to Germany.

Notwithstanding these reports, it is believed that, for the purpose of deceiving the enemy, Germany has greatly exaggerated these statements, and that these supplies are not so abundant as reported.

See also

KRUPP STEEL WORKS

Great Britain

[Notes of the War. *Army & Navy Jour.*, Oct 9, '15.]

The British Minister of Munitions announced Oct 2 that 264 additional estalishments, making 979 in all, had been taken over by the government for the manufacture of munitions.

—In European War

See

EUROPEAN WAR—MUNITIONS

—Manufacture of

See also

STEEL—USE OF IN THE MANUFACTURE OF ARMAMENT

—Manufacture of—Factories

[A War Time Miracle at Eddystone. By Donald Wilhelm. *Independent*, Oct 4, '15. 2500 words. Illus.]

Describes the erection in the short space of four months of two large buildings at North Eddystone, Pa., 15 miles from Philadelphia. The buildings were erected by the Baldwin Locomotive Works. One is for the temporary use of the Remington Arms Co. It covers 15.03 acres and has 37.72 acres of floor space. It shelters a plant that when completed will be capable of making 1,500,000 rifles a year. Machinery is being installed. The other building is for the Eddystone Ammunition Co., a Baldwin subsidiary. This building is somewhat smaller than the Remington building, covering 14.8 acres, with 1,296,250 sq. ft. of floor space. In this building, the Eddystone Ammunition Co. will make 20,000 shrapnel a day. Both buildings are designed to revert to the Balwin Locomotive Works for use as a part of their plant when no longer required for the manufacture of arms and ammunition.

—Manufacture of

[Co-operative Manufacture of Small Arms. *Arms and Explosives*, May '15. 1100 words.]

The problem of decentralized effort in making war materials raises a complex problem in respect of machined parts. To the novice or average machinist it might seem easy to reproduce by hand many parts, for example, of the rifle. Practice does not justify the belief. To illustrate, the firing pin looks like a simple thing. But the metal must have a certain toughness, the point must be suitably hardened, and the adjustment of the related parts must be accurate to a degree. What therefore at the outset looks like a simple lathe job, is really one calling for the application of special fixtures. Approximate dimensioning requires an output of hand work on assembling that eats up profits. The result is that articles sold by thousands are a monopoly of firms who realize that half-way measures are bound to fail, and who can employ resources that promise success. However great the demand for a larger supply of small arms, standard methods must prevail. The difficult problem of decentralizing production can be solved only by experts, and if they should refuse outside help, such action would rest on something more than mere prejudice.

See also

POWDER—SMOKELESS—MANUFACTURE OF

MUNITIONS—Continued

—Manufacturing Capacity of

Great Britain

[Notes of the War. *Army & Navy Jour.*, July 31, '15. 50 words.]

According to a statement July 28 in the House of Commons, the British Government has established sixteen munitions factories and will add ten more.

United States

[Plain Speaking for the Services. *Army & Navy Jour.*, Oct 9, '15. 500 words.]

According to a statement by John F. Meigs, U. S. Navy retired, now employed by three great engineering concerns as an ordnance expert, these three concerns will shortly reach a production of 20,000 rounds of field gun ammunition per day.

[How Fast Can the United States Make Arms and Ammunition? Anonymous. *World's Work*, June '15. 2100 words.]

In any war in which we might be engaged, we might get armament from other nations, but the conditions might force us to depend upon our own resources. Our manufacturers could probably supply the food, clothing, and miscellaneous supplies needed. The real problem is the supply of arms and ammunition. For an army of a million men, which would probably be needed to resist invasion successfully, there should be on hand at the outbreak of war 4 million rifles, 1200 machine guns, 8 billion cartridges, 4000 field guns, and 8 million rounds of field gun ammunition. The manufacturing forces should be capable of replacing this ammunition supply every month and the guns and rifles in two years.

A year ago, the capacity of private plants to manufacture field guns was less than 400 a year, the government arsenals having about equal capacity. It would have taken all plants ten years to turn out the initial supply of artillery ammunition while the capacity in small arms ammunition was less than one-hundredth of that necessary.

England has increased her capacity to manufacture munitions to sixteen times that of a year ago, and every machine shop in the country which contains the necessary tools is being utilized to satisfy Gen. French's call for ammunition. The same thing is true to a limited extent in the U. S. in filling war contracts. The regular plants for making guns and explosives have increased their capacity greatly. The DuPont Powder Co. has multiplied its output tenfold. The Westinghouse Electric and Mfg. Co. has purchased and enlarged the works of the Stevens Arms & Tools Co. Plants never previously engaged in the manufacture of shell and shrapnel are undertaking that work. Many companies, particularly around Detroit, Columbus, Cleveland, Toledo and Pittsburgh, are making projectiles. Fifty firms are now engaged in such work as against ten a year ago. Six firms are making fuses. Two firms besides the DuPonts are making powder.

It is difficult to estimate the increase in capacity of our manufacturing plants. They would probably have to be increased a hundred fold before we would be independent of outside aid.

It is difficult to estimate accurately the quantities of munitions being furnished by America, but it is probably not more than 25,000 rounds of artillery ammunition and 50 million cartridges per month. These totals are insignificant compared with the totals required. The exports of such materials as copper, cotton, oils, foodstuffs, etc., are probably of greater importance.

(NOTE.—The remainder of the article deals with naval requirements.)

[Production of War Supplies. *Army & Navy Jour.* May 22, 1915. 200 words.]

The U. S. is now able to manufacture 20,000 military rifles per day, and the Bethlehem Steel Co. can make guns at the rate of considerably better than a battery a week, with other plants close behind in production. The productive capacity is equal to the nation's need in time of war in all matters of supply of munitions. The data as to the production in an emergency are valuable. (From the *Philadelphia Bulletin.*)

MUSIC, Military

See also

BANDS, MILITARY

MUSKETRY

See

INFANTRY—ARMS—INSTRUCTION AND TRAINING

INFANTRY — FIRE — INSTRUCTION AND TRAINING—MUSKETRY

NAPOLEON I. (Emperor of France)

[Napoleon I. Maxims and Thoughts of the Prisoner of St. Helena. By Emilio Gaiani. *Riv. Mil. Italiana*, Apr.-May, '15. 14,000 words.]

[This is a collection of 469 brief sayings of Napoleon, taken from a manuscript found among the papers of Las Casas. They relate to many phases of life—war, government, philosophy, history, and so on. From their concise form they are not adapted to further condensation.]

See also

NAPOLEONIC WARS

NAPOLEONIC WARS—1805

[The Grand Army and the Invasion in 1805. By Maj. C. H. Wilson, R.F.A. *Jour. of the Royal Artillery*. Feb. 1915. 400 words, 2 maps.]

Note.—This article is chiefly concerned with the naval aspect of the situation. Napoleon had concentrated in the vicinity of Boulogne an army of 158,000 men and 450 guns, ready to invade England if the way could be cleared. The movements of the French and English fleets to the West Indies and back, and the resulting dispositions show that the way for the invasion might have been cleared. Villeneuve declined to face a general action when the chances were in his favor. The oppor-

tunity was lost and the Grand Army—the best France had as yet turned out—was directed against Austria.)

See also

AUSTERLITZ, BATTLE OF

—1813—Jan-Apr.

[Centennial Anniversaries of Historic Days, with Special Reference to the Artillery and Technical Troops. By Col. Anton Christl, Austro-Hungarian Army. *Mitteilungen über Gegenstände des Artillerie und Geniewesens.* Jan. 1915. 15,000 words.]

The 15th year of each of the last four centuries has found Austria engaged in war, a hundred years ago as a member of the coalition against Napoleon.

At the close of 1813, the allied troops were disposed in three principal groups:

The main allied army of 200,000 men under Schwarzenberg on the upper Rhine.

The Army of Silesia under Blücher (80,000, increased by 10,000 in Feb. 1814) at Coblenz, Mayence, and Mannheim.

30,000 Prussians under Bülow and 40,000 Russians under Winzegerode in Holland.

This total of 360,000 men and 1238 guns was opposed by a French force of about 100,000 men.

The Allied plan contemplated an advance to the line Langres-Metz by Jan 20, 1814, and a subsequent advance via Troyes and Vitry on Paris. The armies in Holland were to move through Belgium into France. Napoleon's plan was to delay the Allies by retiring slowly on Châlons to gain time to concentrate there a sufficient force to assume the offensive as the situation might dictate at the time.

After Leipzig, the French had retreated ultimately to Frankfurt, defeating a force under Gen. Wrede at Hanau Oct 30-31 to open the way. After crossing the Rhine, Bertrand's corps (15,000) was left at Hochheim. He was attacked and driven from this position to Kastel on Nov. 9, which action concluded the operations of 1813.

The main army of the Allies was to cross the Rhine in nine columns, a number of them by pontoon bridges. Great difficulties were encountered in laying these pontoon bridges, due to high water and swift current, causing the anchors to drag. They were too light for the severe conditions. Auxiliary cables from bank to bank were tried unsuccessfully, and one of the principal bridges eventually had to be built lower down stream where there was better holding ground for the anchors. One of the bridges (at Kaub) was built of Russian canvas pontons. Guns and wagons had to be sent over carefully and at intervals to prevent swamping the pontons.

In the latter part of January the crossing had been effected and the allied columns were advancing. Napoleon had concentrated the bulk of his force at Châlons. He attacked and defeated Blücher at Brienne Jan 29, but was himself defeated at La Rothière Feb. 1-2. The French retired on Troyes followed by Schwarzenberg, Blücher advancing along the Marne on Paris. Napoleon attacked and defeated the divided forces of Blücher at Champaubert, Montmirail, Chateau Thierry, and Vauxchamps, and drove Blücher back on Châlons.

Schwarzenberg arrived at Troyes, and later began an advance on Paris, which was abandoned because of the news of Blücher's defeats. The Allies concentrated at Troyes on Feb 21.

Schwarzenberg now decided to retire to Langres, and Blücher was to join forces with the army of the North in an advance on Paris. In the execution of this plan, Napoleon attacked Blücher, whereupon Schwarzenberg moved forward and defeated Oudinot at Bar-sur-Arbe Feb 27, and continued toward Troyes. Blücher continued his movement to Laon. Napoleon turned his force against Blücher, and was defeated at Laon Mar 9-10. There being no pursuit, Napoleon gathered his forces and defeated a Russian corps under Priest at Rheims on Mar 13. Schwarzenberg started to fall back on Trannes, but becoming aware of Napoleon's dispositions, moved forward instead to Arcis-sur-Arbe, effecting his concentration there by Mar 21. Napoleon started to attack, but learned that the entire army of Schwarzenberg was in his front and retreated to the upper Marne to operate against his rear.

The Allies now advanced directly on Paris, and began the attack on Mar 30. Finding that the threat against Schwarzenberg's rear produced no effect, Napoleon decided to move via Troves and Fontainebleau to Paris and unite with Marmont and Mortier. Hastening ahead to take command of Paris, he arrived at Cour de France, 20 km. south of Paris at about 10 P.M. Mar 30, where he was met by some of Mortier's troops retiring pursuant to the terms of the convention for the evacuation of Paris. Napoleon returned to Fontainebleau and by April 3 managed to gather 35,000 troops with the intention of retaking Paris, but Marmont's defection precluded further operations.

On April 6 Napoleon abdicated, and the Allies concluded peace with the new King of France, Louis XVIII.

—1814, Feb

[Centennial Anniversaries of Historic Days, with Special Reference to the Artillery and Technical Troops. By Col. Anton Christl, Austro-Hungarian Army. *Mitteilungen über Gegenstände des Artillerie und Geniewesens.* Feb., 1915. 10,000 words.]

When Bavaria joined the allies and Tirolese neutrality thereby came to an end, Marshal Hiller was able to assume the offensive against Eugene in Upper Italy.

He accordingly advanced to Trent, where he arrived on October 20, 1813, Eugene retiring from the Isonzo to the Adige, destroying all bridges behind him. This caused the advancing Austrian columns great difficulties that gave their engineers many opportunities to exercise their resourcefulness. By November 16th, Hiller had his army posted between the Alpone and the Adige, fronting Verona. A lull in the operations now ensued

NAPOLEONIC WARS—Continued

which lasted until Feb 18, 1814. The allies meanwhile received reinforcements that raised their force to 70,000 in Italy.

Murat, after concluding an alliance with Austria on Jan 11, 1814, occupied the Roman and Tuscan provinces and advanced toward the Po. As a further advance of the Neapolitan army would have threatened his rear, Eugene evacuated his position and retired to the Mincio, his left at Peschiera, his right at Mantua-Borghetto. The Austrians followed, taking up a position at Villafranca on Feb 5.

When, on Feb 7th, the Austrians learned that the hostile army was retiring on Cremona leaving only two divisions to guard the line of the Mincio, they decided to cross the Mincio at Pozzolo and Vallegio. The information upon which this decision was based shortly proved to be wrong. Eugene did, indeed, intend to leave the Mincio because Murat was threatening his rear, but when Murat assured him that he need fear nothing from the Neapolitan army, he decided to assume the offensive himself with the intention of recovering the line of the Adige. He accordingly began crossing the Mincio at Monzambano, Goito, and Mantua at the same time that the Austrians were crossing at Pozzolo and Vallegio. This led to a series of isolated attacks that are collectively known as the battle of the Mincio (Feb 8th, 1814), in which both sides claimed the victory. As a matter of fact, both armies resumed their original positions on Feb 9th, and remained in those positions, minor operations excepted, until the close of the war.

—1815

[Wellington in Belgium (April-June, 1815). By F. Ashford White. *United Service Mag.* Apr. 1915. 1000 words.]

[This is a short article covering the period from the arrival of Wellington in Belgium on April 4th, 1815, to the battle of Waterloo, with a few historical references to England's militia at that time and its transportation to Flanders.]

NASHVILLE, Battle of

[The Battle of Nashville. By Maj. Wm. J. Harts, C.E. *Professional Memoirs,* Mar-Apr, 1915. 4000 words, 2 maps.]

This Civil War campaign, so replete in lessons and warnings, is reviewed in some detail;—the hope of the South that the impetuous Hood would thwart the successful Union flanking movements; Hood's crossing the Tennessee River in November, 1864, after waiting vainly for reinforcements; his failure to cut off Schofield's retreat at Spring Hill; the desperate attack and repulse at Franklin; the arrival before Thomas' entrenched lines at Nashville; Thomas' deliberation and final brilliant attack on Dec 15, feinting against Hood's right and crushing his left; Hood's continued resistance the next day; his final disastrous defeat and retreat.

Lessons: this battle was an example of a well planned attack, simple and strategically sound, and executed with admirable co-operation and spirit. Schofield's isolated position on the Tennessee should have been better supported, and Hood's advance opposed earlier. A part of Sherman's force might well have been detached to Thomas' assistance, in the latter's precarious situation. For the Confederates, Hood's delay in crossing the Tennessee probably lost him the campaign by giving Thomas time to concentrate. His failure to intercept Schofield's inferior force was fatal; after that and the costly failure at Franklin, any movement against Thomas' entrenched lines was hopeless. The first day's fight at Nashville should have shown Hood the futility of continuing; he might then have made good his retreat and remained a factor in future operations.

NATIONAL DEFENSE LEAGUE (U. S.)

[A Congress on National Defense. *Arms and the Man,* June 10, '15. 450 words.]

The National Defense League will hold a conference on national defense at Washington Oct 4-7, to discuss measures to put the U. S. in a position where they can maintain their dignity and security throughout the world. Mr. Julius Kahn, M.C., from California, Chairman of the League, will preside.

NATIONAL GUARD (U. S.)

[The National Guard as a Factor in Our National Defense. By Col. A. C. Pack. *Arms and the Man,* Aug. 26, '15. 2800 words.]

While the main reliance of the country in time of war must be upon a "citizenry trained and accustomed to arms," we have no such citizenry. All the men who are trained and accustomed to arms are members and ex-members of the National Guard and the Regular Army. The Militia will always have something wrong with it until it is federalized. Both the Regular Army and the National Guard are kept at peace strength, and must be doubled by the addition of recruits to attain war strength. This is a weakness of the Regular Army and a menace to the National Guard. They should both have war strength companies.

The weaknesses of the National Guard are numerous. Each state controls its own forces, and they may or may not conform to standards. There are too many high officers. Among the exceptions is Michigan, with one brigade of infantry and auxiliary troops, and only one brigadier general.

Some National Guard officers are most capable. Others are not so good. Election of officers is responsible for the latter class.

The great problem is recruiting. The Pay Bill is supposed to be a solution. In so far as it gives proper pay to company, troop, and battery commanders, it is good, but the pay to field, staff, and higher commanders is too high. Pay will probably not alter the situation as to enlisted men. One of the central states has tried this experiment without result. The secret of full ranks is *esprit.*

Recruiting is interfered with by labor organizations, generally where the Guard has been used in strikes. Guard officers deprecate the use of the National Guard for this duty.

The National Guard should be made a truly national force as in Switzerland. There every man has to serve a short time with the colors. His training begins in school. Every man of proper physique should serve three years in the National Guard upon attaining the age of 21. A law covering this principle should be drafted and submitted to a vote of the people. Some of the details and objections are discussed, and Australia is cited to prove that the labor unions would not oppose such a law.

The Regular Army should be increased, but mainly in the branches requiring technical training.

Comparing volunteers with the National Guard in 1898, the Guard had the advantage of a skeleton organization which could be expanded. The volunteers had to be entirely newly organized with officers strangers to each other in a military sense, and in some regiments the highest officers had had no military training or experience. A few of the National Guard organizations could take the field to-day and give a good account of themselves, but it would have to be with their present membership. If flooded with recruits, it would be unsafe to trust them with the great task.

[Labor Sees Light. *Arms and the Man*, Sept. 23, 1915. 700 words.]

Gen. Harvey, commanding the N. G. of the District of Columbia, in a letter addressed to a labor convention, points out that modern war calls more strongly than ever before for technical troops, and that troops of this class can best be supplied by "labor." Fitness, no less than duty, therefore suggests that organized labor should seek enlistment in the N. G. in order to obtain training. Gen. Harvey offers to confer with labor authorities, to the end of organizing an engineer militia company for the District, and this offer was accepted practically unanimously by the convention.

[The National Guard Association Meets. *Arms and the Man*, Nov. 18, '15. 1000 words.]

"At the final meeting of the three-days' session of the National Guard Association at San Francisco last Thursday, November 11, a report of the legislative committee was adopted unanimously pledging the organization to work for the following plan of national defense:

For the increase of the Regular Army according to the plan of President Wilson.

For an amendment to the Federal Constitution making the Militia available at the call of the President within or outside of the United States to the same extent as is the regular military establishment, reserving to the States the control of the Militia in time of peace.

For the appointment of officers of the Militia in accordance with a uniform system to be prescribed by Congress.

For the organization of a Federal Militia in any State or States in which a State Militia is not maintained.

Under these plans, Congress would prescribe the training, discipline and equipment of the Organized Militia.

For the enactment of legislation making the National Guard, or Organized Militia, immediately available on the first line of defense.

For the enactment of a National Guard pay bill by Congress, in which bill shall be a proviso that leaves of absence without loss of time, pay or efficiency rating be given to all Federal civil employes for performance of military duty in the National Guard.

The executive committee of the association was empowered and directed to take all necessary steps to procure the enactment into law of these recommendations.

The convention unanimously voted to levy an assessment of $25 for each 500 men of the National Guard in each state for the purpose of maintaining a legislative committee at Washington during the coming session of Congress to look out for the interests of the service.

A resolution introduced by Gen. Henry D. Hamilton, of New York, giving indorsement to the administration's plan for the creation of a "Continental Army," otherwise Federal Volunteers, was sent to the legislative committee without debate, and later was laid on the table by unanimous vote, on recommendation of the committee.

"'It was said,' reports the Associated Press, 'that the National Guard Association was opposed to the Continental Army plan of President Wilson because it was believed it would conflict with the organization. Some of the officers contended that if a larger reserve force was to be provided it should be done under the guidance of the National Guard.'"

See also

Army—Organization—Swiss-Australian system
Field Artillery—Instruction and Training—Militia—United States
United States—Army—Federal reserve
United States—Compulsory military service
United States—Militia
United States—Military policy of

—**Advertising the**

[A Publicity Scheme for the National Guard. *National Guard Mag.*, Sept., '15. 2400 words.]

Describes the scheme for bringing the National Guard to public attention by causing the publication in local newspapers of an article describing the National Guard, and the benefits to be derived by service therein, through the training received and the incidental access to club and gymnasium. The article and the letters sent to local editors are given in full.

[A Plea for Greater Interest in the National Guard. By R. H. Elliott, Co. M, 1st Md. Inf., *National Guard Mag.*, Nov., '15. 1500 words.]

If each community develops an adequate and trained force, the needs of defense will be satisfied. The Organized Militia under the tutelage of the Regular Army, is gaining high efficiency. There is some unit of it in all the principal towns and cities, which offers to nearly every citizen an opportunity to secure military training if he desires to himself be prepared for service.

NATIONAL GUARD (U. S.)—Continued

Lack of interest in the National Guard is due largely to thoughtlessness and carelessness, to parental objection, to the disapproval of employers, and to lack of civic interest. The guard offers many social advantages in the armories, and many material advantages in discipline and training.

Employers should regard the possession by the government of an adequate armed force as necessary insurance, and should encourage employes to serve in the Guard.

—Federal control of

[Why Militia? By Maj. L. R. Naftzger, Insp.-Gen. Indiana. *Infantry Jour.*, Jan-Feb, 1915. 2500 words.]

There are two generally accepted principles of a sound military policy for the United States; first, the organization of the army upon an expansive principle; and second. an organization of the mobile army into tactical divisions.

There is a division of opinion upon the question of whether the expansive principle shall consider the militia as a reserve, or whether, in accord with Upton's Military Policy, a volunteer force shall constitute the reserve.

The Militia Pay Bills have in view the use of militia as a reserve. This is the most expensive and least effective means of creating a reserve. If the United States is to have any force of partially trained soldiery to augment the regular army, it is necessary to abandon the militia idea entirely. There is no way to get rid of the constitutional restriction of state appointment of officers and state supervision of training, resulting in forty-eight contingents diversely trained. The state militia is not sufficiently like the citizen soldiery of Great Britain and its colonies to justify comparison, unless each colony is assumed to bear the same relation to the British government that each state does to the Federal government.

An efficient reserve cannot be created without some system of pay. It is doubtful if any system of militia pay would compensate the National Guard for the time now devoted to military training. The pay should be given to the force constituting the reserve, and the efficiency of this force should not be measured by the standard of the regular army, though it should approach that in essentials except field training, and qualities resulting from permanent association under disciplinary routine. A paid reserve will result in a tendency to create state constabularies as state police forces, leaving little need for state militia. This will obviate the use of the reserve force in riots and labor troubles, thus removing the greatest deterrent to enlistment in a reserve force.

[The War Efficiency of our Citizen Soldiery. By Lt. Col. Evan M. Johnson, 19th Inf. *Inf. Jour.* Mar-Apr. 5000 words.]

War efficiency consists in that degree of preparedness of the military resources which permits of prompt mobilization and prompt use on the battlefield. Our policy has been to maintain a small regular army, and in case of emergency to hastily call, organize, arm and equip citizen soldiery. Considering final results alone, we may be said to have been successful so far. The cost in unnecessary loss of life due to lack of tactical training; in the far greater loss due to ignorance of sanitation; in time in preparing the untrained force; and in equipping, arming, and supplying this army at inflated war prices, has been heavy. Have we an efficient police? To properly discuss the subject, we must remember that the distance factor is negligible due to modern facilities; that at least three nations can land 150,000 trained troops in from two to four weeks; that forts protect harbors but do not prevent hostile landing out of range; and that the navy may be overpowered by the enemy's fleet.

There are but 30,000 trained troops in the United States to-day. There is no trained reserve, and the first defence of our coasts must fall upon the citizen soldiery. A careful official study estimates that for successful defence, a first line of 460,000 men and a coast artillery force of 42,000 men are necessary.

Control of the militia rests in the Federal government and in the state. This divided control militates against efficiency. The effort of the Federal government to organize divisions has been unsuccessful. There is but one division organized instead of the twelve called for by the defense plans. The strength of militia companies is very low and statistics show that 50% only can be counted upon to come forward. Armament and clothing are incomplete; delay must result when mobilization becomes necessary. The U. S. is empowered to organize, arm and train the militia force, but it can not appoint, promote or dismiss, in peace or war, a single officer. Training is not satisfactory; there is no homogeneity of effort. The U. S. can prescribe organization, armament, and discipline (training) for the militia. It cannot compel the organization of new units or the maintenance of existing units; it cannot train the militia.

The militia cannot be organized into larger units owing to the faulty proportion of the different arms. It is not sufficiently instructed to oppose trained troops. Six months, at least, are necessary to prepare this force to take the field. Bull Run, a Pyrrhic victory, with victors demoralized as badly as vanquished, and the Spanish-American War where the organization, concentration and equipment of the volunteer force was not even completed five months after the declaration of war, are matters of history, as is also the loss of American lives and the lavish expenditure of public funds. How much time will the absolutely untrained volunteer require for training, if the organized militia requires six months of preparation? McClellan, in spite of the clamor to move forward, spent ten months in organizing and training and did not then have a trained force. In addition, his army was very weak in officers.

Our military policy does not lead to efficiency. Certain constitutional amendments hamper the federal power. Due to inherent defects in our laws, twelve million dollars spent annually do not secure this efficiency. Individual effort and quality of material are

not lacking; the policy needs regeneration. It must be such as will give to our country a first line of dependable soldiery, regular and citizen, strong enough to hold in check a hostile army for a time long enough to enable us to organize the army of volunteers upon which we must finally depend for our national defence. If this be not done, our next military ordeal may produce an even worse disaster than Bull Run.

[Federal Control of the National Guard. Anonymous. *National Guard Magazine*, Apr 1915. 3200 words.]

History teems with examples of the failure of divided control and the success of central control in military operations. We have in the National Guard forty-eight separate little armies, with many disintegrating agencies at work. Our history shows that prompt and complete co-operation of the state forces in national defense cannot be relied upon. Local interests can be submerged only by acute crises.

The response to the requests and suggestions of the War Department varies in different states from ready acquiescence to open opposition. The War Department is without power under present laws to actually direct the composition and training of state forces.

The French have given an example of drastic readjustment by one man power in time of stress, an example that we cannot hope to imitate. The National Guard should frankly recognize that the regular officer and enlisted man compare with the national guardsman as an experienced professional man does with a new college graduate. But the National Guard and the Regular Army should constitute parts of the same force without any line of demarcation. The National Guard must be Federalized to be effective. Personal considerations must be subordinated to the requirements of National Defense.

[Nationalization of the National Guard. By Capt. Tebbetts, Troop A, N. G. Oregon. [Reprint from the *Oregonian*.] *Jour. U. S. Cav. Assn.*, Apr 1915. 1000 words.]

[A plea for Federal control and pay for the National Guard together with certain connected features, such as: detail of officers of the National Guard for tours of duty with regular troops; detail of regular officers for command of all National Guard regiments; removal of age restriction in commissioning Nat. Guard officers in regular army, etc.]

[Shall the National Guard be Federalized? Discussion by Adjutants General of Certain States. *National Guard Mag.*, June, '15. 3600 words.]

With a view of securing wide discussion, letters were addressed to the Adjutants General of the states, inviting them to express their views relative to the article on "Federal Control of the National Guard." Replies have been received from ten Adjutants General, and these replies indicate that sentiment is far from crystallized in favor of Federal control. Four replies are published (Michigan, Rhode Island, New Mexico, and South Carolina) all favoring Federal control as promoting efficiency, principally because of being able thus to eliminate political appointments of officers. One suggests leaving designation of officers to states, subject to Federal examination and appointment. Federal control means of course also Federal pay.

The objections to Federal control are various, some feel that there are in the War Department many officers who, while desiring to advance the efficiency of the National Guard, do not understand the peculiar conditions attending that service. There is also a feeling that there are officers at Washington unfriendly to the National Guard, who believe that discrediting the National Guard would help legislation favorable to the regular army.

One reply expresses the opinion that Federal control is fraught with danger because agitation may operate to prevent remedial legislation sanctioned by the National Guard; that the people will object to legislation depriving them of a military force controlled by the people; that a substantial increase in the regular army would be preferable; and that the proposed change would prevent the creation of an adequate defense force for the nation.

Other opinions are that Federal control means the destruction of the National Guard, as it could not be maintained for purely state service; that discussions of the Dick bill showed that National Guard officers feared that the provisions governing the organization of a volunteer force would work injury to the National Guard; that a number of National Guard officers predicted the failure of this section and finally only the section governing the qualifications of reserve officers was passed and this has failed in its purpose. One correspondent remarks that he has never yet met a regular officer who could appreciate the difficulty of maintaining enlistment in the National Guard.

Both sides of this discussion are published in order that eventually a proper solution of the question may come forth.

[Again—Why Militia? By Major Leslie R. Naftzger, Inspector General, Indiana. *Infantry Jour.*, July-Aug, '15. 350 words.]

In spite of oft-quoted assertions to the contrary, the United States has a milit.ry policy. This policy has not been effective because Congress has consistently failed to make it effective. The military policy may be briefly stated as follows:

1. A Regular Army sufficiently large to maintain coast defenses in useful condition, to provide a mobile army, to maintain systems of military instruction, to provide a trained officer personnel, etc., etc.

2. A Reserve Army, organized, armed and disciplined as provided for the Regular Army, trained in fundamentals, but devoting only such part of their time to military instruction as will not interfere too much with civil pursuits.

3. The militia, educated as much as possible, to be utilized as volunteers and to receive training at rifle clubs, military and land-

NATIONAL GUARD (U.S.)—Continued

grant schools, and in independent military companies organized for military instruction.

The creating of a Reserve Army presents the gravest questions, and will be considered solely from the viewpoint of law. These once settled, the details of legislation and administration present no great difficuty.

The militia cannot be used by the United States for military service because of the constitutional limitations upon the duties of the militia, which, of course, limit the President's authority to call it out.

Irrespective of the intention of the framers of the Constitution, there is no authority given the U. S. for governing the militia, except "such part of them as may be employed in the service of the United States." The authority is dual, and the United States can not compel states to appoint officers or to provide for training. The state has an absolute veto power over all Federal legislation looking to "common defense." Suppose the states are willing to co-operate. Can the status of Federal soldier be superimposed upon the status of militiaman? These militiamen under Federal control would be no longer the constitutional militia, but a force created by contract.

The militia pay bills seek to create a contract status for future service, and in the absence of judicial interpretation, it might be very embarrassing for the Federal Government to depend upon such contracts. The efficacy of the contract is questionable, if the individual or the state should be averse to entering into the military plans of the government.

The executive authority for appointing officers can also be swept aside by the process of calling the militia into the service of the United States. In the absence of such commission, would such officers have the necessary powers?

The necessary thing to do is for Congress to act upon the plan outlined years ago by General Upton. The military establishments of the several states press hard upon constitutional inhibition against maintaining troops; they are not effective, are very expensive, and there is scarcely an argument for their continuation as state troops. The same arrangement as now exists, after eliminating the dual allegiance, will furnish an efficient and adequate force to secure the continuance of our national life. The United States will be supreme in a military sense, and no state right will be violated.

[Nationalization of the National Guard. By E. W. Duke, Asst. Sec'y, National Security League. *Scientific American,* Nov. 6, '15. 2500 words. Illustrated.]

Preparedness includes not only men, but also the costly mechanical appliances used in war. Men must be trained to use the latter. Our country is mainly dependent upon the militia in time of war. We have about 25,000,000 men of military age. The problem is to convert the needful part of this number into citizen soldiery.

In every war, we have had to equip, organize and train our forces after war began. Our present National Guard is by far the most effective organization of citizen soldiers we have ever had, but it comprises only one-half of one per cent of our citizens of military age, and is far below modern standards of war in equipment, organization and training.

Opinions and suggestions have been asked from various National Guard officers. All agreed that the first and most important step was to place the National Guard practically under the full control of the War Department. Other necessary measures are greater financial support, and the Militia Pay Bill is of vital importance. Moral support of good citizens is also an important factor.

We should dwell on the idea that service in the organized militia is an honorable and patriotic duty. The importance of having certain wealthy corporations allow National Guardsmen the necessary time for their duties as such without loss of pay has perhaps been exaggerated. What is more necessary is for all employers, great and small, to allow these men the necessary time off for their military duties. The greatest obstacle to efficiency in the National Guard is lack of men and lack of funds. Too many citizens sneer at the Guard, and this attitude is detrimental to it. Comparison of the Guard with the Regular Army is unjust. The conditions are not the same. In the Guard, the company commander has to secure his own recruits against the opposition of employers, the mandates of the labor unions, and the scornful attitude of certain citizens. We shall never have an adequate citizen soldiery until service in that body can be made popular.

The United States does not belong to the present generation; we hold it in trust for future generations, and must guard against not only probable but also against all possible dangers. Our present unpreparedness is a matter of grave concern. The National Security League is endeavoring to crystallize public sentiment in favor of national defense, and it has asked 15,000 firms to do their part in assisting to make the National Guard effective.

—Instruction and Training

[Observations of an Inspector-Instructor. By Lieut. F. W. Brabson, 23d Infantry. *Infantry Jour.,* Jan-Feb, '15. 4800 words.]

The desirability of a militia detail will be determined by replies to the following questions: Would you object to being absent from your station at least one hundred days a year, mostly between April and September? Are you fond of teaching, for teaching, preparing examinations, criticising solutions, etc., is a very important part of the detail? Have you a tactful manner? the reply to this being from your own knowledge of yourself.

Having determined the desirability, the ground of your new relationship must be reconnoitered. You must make yourself liked by all the best officers and men. You must be tactful to be successful, as wise as a serpent and as harmless as a dove. Do not discuss personalities. Give no grounds for of-

fense. Criticize justly and do not be ashamed to admit that you are wrong, when you are convinced of it.

Be careful not to accentuate the duties of inspector to the neglect of those of instructor. Do not set up too high a standard to attain, but rather readjust the standard to the conditions found.

Rank has the same advantages in the militia as in the regular service, and it seems wiser to detail officers above the grade of lieutenant for permanent inspectors. The national tribute to rank is seen daily in the army. As most tactical matters discussed deal with regiments, an older officer is presumably better fitted to fulfill the function.

The work begins with the indoor school November 1. This school, in many states and for many reasons, such as lack of support, lack of funds, etc., degenerates into an unsatisfactory correspondence course. Post graduate schools do likewise, and it is here that the personal service of the Inspector-Instructor is necessary. His influence is indispensable, since in this school is found the best opportunity for educating the entire regiment.

The non-commissioned officer schools should be organized by battalions, not companies. Competition is thus encouraged and different view points are presented. Small field problems, to be discussed later, create interest and stimulate recruiting. Printed progressive schemes and a large number of instructors will secure best use of the time. Indoor drills and indoor gallery competitions for the men will tax the ingenuity of the Company commander to secure attendance. In drills, point out flaws before the second execution of the movement, and attempt to form a habit in the soldier. Indoor gallery competitions, with prizes under Sec. 1661 R.S. greatly stimulated interest in Tennessee last year.

From January 1 to June 1 yearly, the annual inspection of and report on state headquarters, the rifle range, store houses and each organization is made. The property must be checked and examined and defects and discrepancies satisfactorily accounted for. Be careful to do the officer and the organization no injustice. Bear in mind the limitations of time and personnel, armory facilities, etc.

Extracts from the report to the Adjutant-General will come back to the officer criticized, so use tactful language.

Camps of instruction for officers follow. These camps are recognized by progressive national guardsmen as being very valuable. Try to find undulating ground in the camp for illustrating tactical solutions; if possible a terrain for field firing should be had. A target range is needed for instruction of new officers in principles, so that they will learn how to handle a company on the range. A provisional war strength company of non-commissioned officers will inculcate true ideas. For field work, however, about sixty n.c.o.'s to one officer is all that can be handled. Do not have over twenty student officers in a section. For your schedule select first the subjects that can not be readily taught by correspondence, and second the subjects needed most by the officers concerned. New treatment of the subjects is necessary to hold interest, although occasionally officers must be shown that there is something more to an old subject than they thought. The ground must be varied more than in the post work. The maneuver period of ten days requires a field inspection report, in which the statements must be well considered so as to do justice both to the Federal Government and to the organization. Exercise care in the selection of terrain for instruction. Close order drill has no place in camp. Devote at least one-half the time to a sustained problem involving marching and a daily change of camp site. Do not allow troops to bring on a fight with the enemy imperfectly developed. Errors committed prior to arrival at 800 yards will often afford data for a decision. Night operations are especially valuable. Consolidate companies, as it will instruct both men and officers.

The annual rifle and pistol competitions and the selection of a state rifle team complete the list. Special duties, such as investigation of thefts of property and losses by fire, availability and purchase of rifle ranges, editing of bulletins, etc., for the information of the guard, present themselves frequently.

Do not become attached to your charge to the extent of having your judgment warped. It is natural; guard against it. Attempt to instruct the higher militia officers by assembling troops of several adjacent states and forming brigades and divisions.

The War Department should test officers before assigning them to militia duty. The Federal Government should pay the men whose state can not or will not do so.

The men on this detail, by their patience, capability, tact, and above all, by their optimism, have done a great work; a great deal remains to be done in order to develop this splendid material for the strain of war.

[Efficiency in National Guard Companies. A lecture by a company commander of the National Guard of Minnesota. *Infantry Jour.*, July-Aug., '15. 1500 words]

Efficiency, based upon the individual and collective training of the individual, ultimately means the shooting ability of the unit considered. Musketry training combined with training in fire discipline and fire control is the great essential. Attendance at drills is necessary to secure this efficiency, and attendance is the most difficult to secure. A "Booster Committee" to handle delinquents has worked well in my own company. All unauthorized absences are explained or punished. Non-coms. are required to graduate from a school for selected privates. The course is complete and makes excellent instructors of all those attending. A comprehensive program covering each evening's work eliminates any waste effort. Sergeants are encouraged to specialize and are used to instruct the entire company in that specialty. Small movable targets keep up interest while illustrating problems of attack and defense. Blank cartridges are used for training in fire control with very good results. Suggestions for the betterment of my

NATIONAL GUARD (U. S.)—Continued

own company are always encouraged and much profit has been derived from them.

—Instruction and Training—Of Recruits

[Handling of Recruits in the National Guard. By Major Joseph Klapp Nichols, 1st Inf. Penna. Natl. Guard. *U. S. Infantry Jour.*, Jan-Feb, '15. 7400 words.]

The recruit is the base upon which our entire military organization rests. If of the proper mental and physical caliber, he will, properly instructed, become the efficient soldier, non-commissioned officer and officer. The impressions of the service received upon entrance will greatly influence the recruit during his military career.

Bearing in mind the importance of the matter, the first application of serious thought comes in the choice of the recruit instructors, the second in the subject taught. The company commander is charged with the heavy responsibilities of the first. To the subjects laid down by the War Department should be added the duties of a sentinel, care and use of clothing, arms and equipment, preliminary instruction in the use of the rifle, the meaning of his oath, such parts of Army Regulations and of the military code of the State of Pennsylvania, etc., as may affect him during his service.

There is plenty of time for this; the bane of our present instruction is that we are in too great a hurry, with consequent detriment to the recruit and eventually to the organization. The ideal instructor, who is interested in and believes in his work, will never fail to arouse interest in the mind of the recruit. He must be a close observer, patient, and able to explain well. The company commander must plan the instruction and select the instructor. This latter can, by doing his full duty, make his recruits a credit to himself and to the company. The recruit is impressionable. The instructor must set an example in bearing, speech and appearance. He must be constantly on the alert to devise new methods of imparting knowledge if the old ones fail. He is not only a student of the art of war, but also of human nature. Corrections must be made promptly before the second execution. A habit is soon formed, and it must be the correct habit.

The recruit thus instructed, who approaches his duties properly, will be rewarded fully by his own conscience and by the praise of his fellows if he earnestly endeavors to get everything he possibly can from his recruit instruction. Good company commanders are born, not made, and no officer in the State Militia should be so carefully chosen. He must first be a judge of human nature; he should possess a thorough knowledge of the military profession, and especially of his own duties and responsibilities. He should have an innate sense of justice and exercise it at whatever cost. Honesty and personal magnetism are vital. He must be the leader in affairs in which his company is participating. He should know personally every man in his company, and assist them in their troubles should they request assistance. Curtness in dismissing a projected scheme is fatal; rather encourage initiative by request for further discussion. If impractical, then take the time to show its defects. A good company is insured by showing interest in the welfare of the men, particularly in camps and in the field. Good meals on time, little every day considerations do their part. The company commander must avoid bulldozing and threatening that which he cannot carry out.

There is much criticism of the method of election of the officers in a Pennsylvania National Guard Company. The men elect the officers, subject to the approval of the state. This election is probably a wiser course than is at first apparent. The state requires only a knowledge of the theoretical side and physical fitness. The State under present methods does not ascertain his moral character, his executive ability, his financial responsibility, his reputation nor his business ability. The men in the company are often in the best position truly to judge.

As to the relations of the company officers, let it be realized that their real duty and function is the company. The lieutenants expect instruction from the captain, he is repaid by the assistance they render. Loyalty must exist at all times. Award of just praise and not criticism will smooth out little differences bound to crop up. All officers must support the first sergeant. He occupies, relative to the non-commissioned officers, the same position as the captain to the lieutenants. His assignments to duty, rewards and punishments, his manner of speech, must not engender a spirit of ill will in the company. He stands for order and should remember that his own inability to keep the exuberance of the men within bounds is the cause of stringent orders to that effect from regimental headquarters. The quartermaster sergeant, through courtesy, interest in his department, etc., promotes in large degree the harmony of the company. The corporals are in intimate contact with the men; the squad is a true index of the value of the corporal. Put responsibility upon them, praise judiciously, punish for wrong but not for an error of judgment. Always use titles for all officers.

The four phases of the militia company's routine are: summer encampments, armory instruction, spring inspections and rifle practice.

Lack of recruits is the problem accompanying the preparation for camp. The suggestion is renewed that regiments be allowed to enlist up to day of departure and that all recruits be segregated into a recruit company.

Two great advantages are that newspaper interest will stimulate recruiting and that eight days camp instruction is worth more than the whole winter in the armory. The increased recruiting will allow of a weeding out of the undesirables of a company.

In camp apply the squad system to all details, pleasant and unpleasant. Hold squad leaders responsible. Delegate authority, but oversee everything.

The annual spring inspection is a test upon

attendance, knowledge of close order work and upon theoretical knowledge of duties of the different officers. Squad system for instruction is also the best here. Pass each man through each squad in turn. Instruction in each squad should be given by the squad leader, and when a man becomes proficient, mark him so upon his card.

Drill attendance, that bugbear of a company commander, is a difficult problem, but it has been, is being, and will be solved. Use postal cards for all absentees. Have plenty of amusement and athletics at the armory. These must be carefully chosen.

Success in handling recruits or in administering a company can only come from following closely certain principles. Intelligent study of daily problems will solve future ones. By attention to duty, justice in rewards, loyalty among all, we will secure the proper support in our work and secure contentment and harmony in the command.

—Reorganization of

[What the National Guard Needs. By Lieut. W. W. Wright, Co. E, 2d Inf., N. Y. C. *Scientific American*, May 29, '15. 2000 words.]

Various efforts are being directed toward the solution of the problem of an adequate military force. The most reasonable and economical way to secure such a force without a large standing army is through the National Guard.

There is, however, a serious shortage of recruits for the National Guard which operates to prevent it from becoming an efficient and powerful reserve. There are many reasons for this shortage. The Guard is no longer a social organization, but is armed and equipped like the Regular Army, and in lesser degree the same work is required as in the Regular service. Therefore the Guard should receive a percentage of the Regular Army pay, as provided in the Militia Pay Bill.

Company commanders of the National Guard have to secure their own recruits, a process increasingly difficult. The Guard has sanitary units, and headquarters companies. Why not a recruiting service? The methods would differ from those of the Regular Army recruiting service. Use of Regular Army bands in connection with patriotic speakers and recruiting officers, and suitable literature describing benefits derived from service in the National Guard, are suggested as means of securing recruits. The work of the Army League in combating the anti-military propaganda of various individuals and organizations is helpful, but the Government may have to take a hand in suppressing this.

The law restricting the use of the uniform should be enforced to the letter. Its promiscuous use by expressmen, cab drivers, drum corps, etc., detracts from its dignity.

[What the National Guard Needs. *Army & Navy Register*. May 15, 1915. 1500 words.]

In considering the National Guard, it should be borne in mind that it is no longer a social organization. It is now a plain business proposition organized on a business basis as part of the Nation's first line of defense. If it could be paid by Congress, it would soon become "the powerful and efficient backbone of our defense which the nation needs and desires it to be." A recruiting service should be established, similar to that of the Army. The use by purely civilian organizations of uniforms resembling those of the Army should be discontinued: such use is really forbidden by law.

[General Boardman Speaks. *Arms and the Man*, June 24, '15. 1400 words.]

After declaring his belief that the Regular Army of the United States should number 500,000 men, General Boardman goes on to say that the organized militia should be included, so that if called out its units should be identical with those of the army. Hence financial support should be given by the general Government. The organized militia should be ordered into service by the President, not asked to volunteer, and when so ordered the State's control should cease. The militia ought, in fact, not on paper, to be organized into the higher units, but the great bulk of the special branches ought to be provided by the Federal Government. Infantry and medical units can be provided by the State.

—Reserve

[The Beginning of a Militia Reserve. Anon. *National Guard Mag.*, Aug., '15. 800 words.]

New York and Ohio have made statutory provision for a militia reserve. The New York law provides for a reserve list of officers, and a reserve list for enlisted men. The latter must, in order to be assigned to the reserve, agree to remain therein for 5 years and be subject when required to physical examination. The reserve men are expected to keep the Adjutant General's office informed of their whereabouts. No duties are required.

The Ohio law authorizes the formation of a militia reserve under such regulations as the governor may prescribe. Eligibility for the reserve requires a full enlistment in the Ohio National Guard or Naval Militia, or in the Army or Navy of the United States.

—Strength of

[Our Military Strength. Current Events and Comment. *National Guard Mag.*, Oct, '15. 700 words.]

The distribution of the National Guard by states is given. The total strength and the apportionment among the various arms of the service are as follows:

Arm.	Officers.	Men.
Infantry	6,328	95,109
Cavalry	298	4,642
Field artillery	314	5,914
Coast artillery	450	7,150
Medical Corps	783	3,550
Engineers	78	1,246
Quartermaster	157	108
Subsistence	19	17
Pay	10	..
Ordnance	59	39
Signal	72	1,470
Total	8,792	119,251

NATIVE UPRISINGS

—Military handling of

[A Coincidence. By Lieut.-Col. J. A. Wilson, D.S.O., 8th Gurkha Rifles. *Jour. of the*

NATIVE UPRISINGS—Continued

United Service Institut. of India. Jan 1915. 4000 words, 1 sketch map.]

While encamped at Ninu, a village of the Dibrugarh hills, on Feb 1st, 1875, a survey party escorted by Assam Frontier Police was attacked by 200 Nagas who cut down many of the escort and Lieut. Holcombe, the Political Officer of the district, who accompanied the party.

A punitive expedition sent out against the Nagas, attacked and burned their villages of Ninu, Nisa, and Khanu, and pursued them until they came to terms.

On Feb 5, 1913, the escort of the Political Officer of the Naga Hills was again attacked by Nagas, near Chenglong. Their villages were again burned and their arms captured or destroyed.

The following lessons may be learned from these expeditions:

A vigorous offensive is necessary. The enemy must be hunted to such an extent that he has no time to prepare ambuscades. The enemy should not be maneuvered out of position by a strong show of force. On the march, independent patrols should cover the movement. The baggage should be reduced to the minimum. Long range firing is useless, for it frightens the enemy and then he can not be caught. The only punishment savages remember is killing their men and perhaps ringing their trees, for it takes only 20 years to grow a man but 60 years to grow a jack-tree.

See also

DUTCH INDIA—ARMY—SERVICE REGULATIONS—(Article: "Fifteen Carbines.")

NAVAL ARTILLERY

[Progress Made in Naval Artillery. By Lt. Gen. H. Rohne, unassigned. German Army. *Artill. Monatshefte*, Apr., '15. 3000 words.]

(Note.—Of historical interest only. Experiments of 50 years ago with British naval artillery are compared with results obtained with modern Krupp artillery.)

Although 50 years ago England led all other nations in construction of large guns, such is not the case to-day. Experiments carried out 50 years ago show the difficulties encountered and progress made at that time. Comparisons will show the wonderful progress which has been made in modern times. Velocities can now be measured accurately. Effect produced is known to depend upon the striking energy and not on the velocity alone as was formerly believed. In the experiments conducted 50 years ago with a 13" gun the projectile weighed 367 kg., initial velocity was about 270 m.s., striking energy 1360 mt. The modern 30.5 cm. Krupp gun (12") fires a projectile weighing 390 kg., initial velocity is 900 m.s., striking energy about 21,550 mt. or almost 16 times as great. The old English gun weighed 22.35 tons, the modern Krupp 30.5 cm. gun, 59.1 tons. Modern projectiles have also a higher factor per unit area of cross section which enables them to overcome air resistance more easily. The old guns were able to perforate 5" steel plate armor whereas the modern 40 cm. Krupp gun will perforate 1453 mm. of modern armor close to the muzzle. Powder pressure in the old guns was 1800 atmospheres, compared to 3000 atmospheres in modern guns. The introduction of smokeless powder has diminished the maximum powder pressure and permitted the length of the gun in calibers to be increased, thus enabling the powder to do more useful work and giving longer ranges. Wonderful improvements in armor piercing projectiles have also been made.

See also

FALKLAND ISLANDS, NAVAL ENGAGEMENT AT
—ARTILLERY ARMAMENT
"KÖNIGSBERG"—"SEVERN" ENGAGEMENT

—Target Practice

Chile

[A World's Record. *Arms and the Man.* Aug. 5, '15. 100 words.]

The Chilean armored cruiser *Esmeralda,* 7000 tons, with two 8-in. and 16 6-in. guns, is reported to have hit the target one hundred times, with no misses. (Distance not stated.)

NAVAL ATTACK

See also

PORT ARTHUR, SIEGE OF

—Coast Defense Against

See

COAST DEFENSE—AGAINST NAVAL ATTACK

NAVAL OPERATIONS

See

CANALS
COAST ARTILLERY
COAST DEFENSE—NAVAL BASES
TACTICS—COMBINED ARMS, ARMY AND NAVY
LANDING OPERATIONS
NAVAL ATTACK

NETHERLANDS, The

See

HOLLAND

NEUTRALITY

See also

AERONAUTICS—NEUTRALITY ASPECTS OF
EUROPEAN WAR—RELATIONS WITH UNITED STATES
WAR—LAWS OF

—Lessons of the European War

[The Puzzles of Neutrality. By Albert Bushnell Hart. *Independent,* May 31, '15. 2000 words.]

Great Britain, France and Germany have set up what may be called an "eclectic international law" based on their respective necessities as developed by the war. One reason for the prevailing confusion is found in the excess of stress on documentary international law, and that too little attention has been paid to the fundamental reasons why there should be neutrals, neutral rights, and neutral trade. The only solution for the United States is to insist upon their right to be, and to act as, a neutral. The English are astonished and disappointed that we do not accept their views, and as for the Germans, they inform us that the blood of German soldiers killed by American shrapnel will cry out against us. Just what the blood of the Serbians killed by German shrapnel in 1912, will do, the Germans do not tell us. The English on the whole are

not so resentful. But with the Germans the case is different, for they have been unable to damage the British merchant service, as they had hoped to do, and in the mean time the British have destroyed neutral commerce with Germany, while enjoying practically all the benefits of it themselves.

The result will undoubtedly be hostile feeling in Germany against the United States, which it will take years to abate.

Among other questions coming up is that of contraband; the crux of the question lies in the list of contraband articles. Upon this question the State Department has been weak, in that it has never protested against the ever-expanding British list. And so of blockade: the old idea of blockade has broken down, inasmuch as our Government has admitted to England that "the methods of modern naval warfare . . . may make the former means of maintaining a blockade a physical impossibility." Then instead of declaring that an impossible blockade is no blockade, our Government accepts the new blockade. Were our Government really powerful in a military point of view, it could protect with more effect. An unarmed neutrality is "a steam launch in a cyclone." The best it can expect "is to live through the storm."

—Violation of

[Violations of Guaranteed Neutrality. Col. F. Feyler. *Revue Militaire Suisse.*, May, '15. 3500 words. Concluded from previous numbers.]

Treats of the violation of the neutrality of Belgium in 1914 and compares it with the violation of Swiss neutrality in 1813. Consists chiefly of matter and documents of alleged official character published in *La Belgique neutre et loyale* by Emile Maxweiler, Lausanne, 1915.

NEUVE CHAPELLE, Battle at

[Phases of the War in Europe. *Army & Navy Register.* May 1, 1915. 1200 words.]

The offensive at Neuve Chapelle was assumed by the British partly because of the general situation, partly from the need of assisting the Russian movement in the East, and from the apparent weakening opposite the British front, and no doubt mainly from the need of fostering the offensive spirit of the men, affected by a long term of sedentary warfare.

In the three days' fighting 190 officers and 2337 other ranks were killed, 359 officers and 8174 other ranks wounded, 23 officers and 1728 other ranks missing. These losses seem very heavy in comparison of the gain achieved.

Great as were the losses suffered between March 10-15, all deficiencies both in officers and men were made good within a few days after the battle. The Flying Corps did remarkable work of most valuable character.

NEW GUINEA

—History

[The Colony of New Guinea. Lieut. J. Lyng. *Australian Military Jour.* Jan., 1915. 1600 words.]

This article treats of the history, annexation and government of the German Pacific Protectorate, of which New Guinea is the most important colony. The life of the population is described and the commercial future of the colony traced.

NIEUPORT AEROPLANE

—Two-seated biplane

[Two-seated Nieuport Biplane. *Flight.* March 19, 1915. 100 words, illustrations.]

This tractor biplane has only one pair of struts on each of the fuselage, and these, instead of being parallel, meet at the lower plane. The gunner sitting has a very wide range of vision downward and forward. In order to avoid the propeller when firing forward, there is a circular opening in the top plane through which the gunner can pass the upper part of his body.

—Armored monoplane

[Nieuport Armored Monoplane. *Aeronautics,* May 15, '15. 50 words. Diag.]

This monoplane carries armor 3.5 millimeters thick on the left side. On the same side is mounted a R. F. gun. The motor is protected by a strong hood. Blades are contrived in the beak of the propeller to project air into the hood to cool the motor.

NIGHT ATTACKS

See

ILLUMINATION

OBSERVATION MASTS, Field Artillery

See

FIELD ARTILLERY—OBSERVATION EQUIPMENT

OBSTACLES

See also

BARBED WIRE ENTANGLEMENTS

OLYMPIC GAMES

—Rifle Shooting

[Rifle Competition at the Olympic Games, 1916. American Protest. *Norsk Militaert Tidsskrift,* Jan, '15. 250 words.]

The *Shuss und Waffe* is quoted as follows: "The Olympic Congress, which met at Paris, decided that the military rifle of the country in which the Olympic Games are held shall be the arm used in the 'rifle competition with army rifles.'"

"The American publication, *Arms and the Man,* protests against this, advising all Americans against participating in the rifle competition in 1916 unless the rule is changed. *Arms and the Man* certainly thereby gives the American riflemen an undeserved reputation for lack of adaptability. Ten good shots by practising with a strange rifle during the period before the games can become quite familiar with it. Proof of this was given by the foreign shots who participated in the international rifle competition with army rifles at Camp Perry in 1912, using the American rifle, beating the American shots. Should the Americans now in 1916 not be able to do what the French, Swedish, Argentines, and Swiss did in 1912? However, we are now in the midst of a serious struggle between the nations, and the gods only know what 1916 will bring."

PANAMA CANAL

—Naval Importance

[The Panama Canal and the World-War. *Jour. Military Service Inst. U. S.*, July-Aug., '15. Translated from the *Kölnische Zeitung.* 2500 words.]

"The building of a canal between the two greatest oceans does not represent so much a desire for commercial supremacy as an increasing determination on the part of the American people to secure sea power."

Provisions of the Clayton-Bulwer Treaty of 1850 (cited in the article) show that this agreement was more restraining to America than to Britain, who was anxious to prevent the canal becoming a military asset of the United States.

In 1880, President Hayes, in a message to Congress, foresaw the coming military importance of the canal, and the desire to eliminate the limitations of the treaty showed strongly in the negotiations leading up to the Hay-Pauncefote Treaty of 1900.

As the Americans did not want to show their cards at that time, they silently agreed to limitations in the latter compact preventing their acquisition of territory on the isthmus, but these restrictions were rendered nil by the energetic action of President Roosevelt in inciting the Panama revolution.

With the canal as an instrument, the determination to establish and maintain a controlling power on the sea has been constantly growing.

The numerous acquisitions of territory and bases on the Pacific and in the Caribbean, and the undenied wish of American statesmen to possess Lower California, all point to the same ambition, though in the Pacific the United States has run counter to Japan and in the Caribbean has aroused the jealousy of England.

The impending conflict with Japan has undoubtedly been the governing factor in causing the construction of the canal and not its commercial importance; and as part proof of this, note the efforts of the United States to prevent the construction of a competing canal.

Those nations which will profit most by the commercial value of the waterway are those most powerful commercially, notably England and Germany.

The immediate consequences of the canal will be greater efforts by the United States to maintain supremacy on the American continent, increased commercial activity, a contest with Japan for the control of the Pacific and to keep the yellow race off the American continent, development of American high-sea traffic, and a gradual development of American imperialistic policy, carrying with it a strengthening of the army and navy.

"The Panama Canal has always been a bone of contention, even before the first spadeful of earth was removed. The Americans have obtained possession of it for the struggle. 'Struggle' is the key-word which has hung over the canal's history and will follow it into the future."

PANAMA-PACIFIC EXPOSITION

—International Military Tournament

[Panama Exposition International Military Tournament. Translation of letter from the President of the San Francisco Exposition by Captain Antonio José da Fonseca. *Boletim Mensal*, Feb, '15. 3500 words.]

PARIS

—Defense of

See also

AERONAUTICS—PROTECTION AGAINST AERONAUTIC ATTACK—FRANCE

PARAGUAY

—History

[Paraguayan War; a sketch of the formation of the Paraguayan nation; extract from a historical memoir. By Colonel Dias de Oliveira. *Boletim Mensal*, Feb., '15. 3700 words.]

(NOTE.—Only brief synopsis of the principal historical events and dates can be given. For details refer to full text.)

1776. Paraguay, created by royal decree, one of the five Provinces of the Spanish Vice-Royalty of the Plata, with capital at Buenos Ayres.

1810-11. Paraguay refuses to join separatists of Buenos Ayres and maintains its loyalty to Spain by force of arms.

Oct. 12, 1811. Paraguayan Independence Treaty signed.

Oct. 10, 1813. Constitution adopted, and two Consuls chosen to govern for one year—Francia and Jegros.

1814. Francia named Dictator for 5 years.

1817. Francia named Dictator for life.

Francia was devoted to his concept of the best interests of Paraguay. He created schools and colleges where the Castilian and Guarany tongues were taught. In order to avoid in Paraguay the anarchy which he saw in Argentina, he isolated Paraguay.

Sept 20, 1840. Death of the Dictator Francia.

May, 1841. Congress of 500 members elected directly by the people named Alonzo and Lopez consuls.

1842. Reforms instituted: commerce, courts of justice, diplomatic relations established 1845, army reorganized, strategic points of Humayta, Passo da Patria, and Assumption fortified, compulsory military service adopted.

1844. Independence of Paraguay recognized by Brazil, Bolivia and Austria. New Constitution adopted, Lopez made President for ten years.

1852. Recognized by Argentina, Uruguay, England, France, United States of America.

1854. Lopez, re-elected for ten years, accepts for 3 years, with right to name successor.

1857. Lopez re-elected; died Sept. 19, 1862.

Oct. 16, 1862. Francisco Solano Lopez succeeds his father as President by election.

Young, ambitious, educated in European modes of thought, he made vast and ambitious plans for the development of his country and for its seizing the balance of power in South America.

To achieve this, the frontiers of Paraguay must be enlarged and a sea coast procured for commercial enterprise.

Relying upon the devotion of the Paraguayan people to their country, a devotion which is fanatical, he dreamed insensate dreams of political hegemony.

He launched Paraguay upon the disastrous war in which the combined forces of Brazil, Argentina and Uruguay finally subdued the indomitable courage and devotion of the Guarany soldiers.

PARISANO "PARAPLANE"

[The Parisano "Paraplane." *Aeronautics*, May 30, '15. 350 words. Diagr.]

An aeroplane expected to meet military requirements is under construction in New York; the special feature is a cylinder, designed to increase lifting capacity and to insure longitudinal stability. Two motors are used, each to drive a separate propeller.

PAY (Army)

Japan

[Increased Allowances for Enlisted Men. Editorial. *Heiji Zasshi*, Mar 15, '15. 240 words.]

The present pay for 1st and 2nd class privates is 2½ cents per day, and for upper class privates 3¼ cents per day. Heretofore this has been supplemented by money from home, but the present rise in prices has so greatly reduced this that recruiting has been much affected. The authorities have tried to overcome this difficulty by increasing the pay, but the proposed increase in the strength of the army and improvements along various lines have operated to prevent it.

PEACE PROPAGANDA

See also

AERONAUTICS—PROMOTION OF PEACE BY
AMERICAN LEAGUE TO LIMIT ARMAMENTS
EUROPEAN WAR—PEACE NEGOTIATIONS
NEUTRALITY
PSYCHOLOGY OF COMBAT
TREATIES—OF PEACE

"PENNSYLVANIA" (battleship)

The largest and possibly the most formidable battleship in the world, the United States super-dreadnought *Pennsylvania* (31,400 tons), was launched at Newport News, Va., Mar 16.

She is 600 feet long and has a beam of 97 feet. Her engines of 31,500 horse-power will develop a speed of 21 knots. The *Pennsylvania* has armor from eighteen to eight inches thick on turrets and thirteen inches on barbettes. Her armament consists of twelve 14-inch (45 cal.) guns in four turrets on the centre line and twenty-two 5-inch guns for torpedo defense. She has four 21-inch torpedo tubes submerged broadside. The *Pennsylvania* will carry 65 officers and a crew all told of 1160 men.

PENTRALITE

See

EXPLOSIVES—PENTANITRODIMETHYLANILINE

PERCIN, Gen. Alexandre

[Concerning General Percin. Editorial. *Artill. Monatshefte.* Jan, 1915.]

General Percin had previously been reported dead, but the latest reports show him to be very much alive. He has been the victim of his political opponents who blame him for the French reverses in Belgium at the beginning of the war. Gen. Percin states that the order to evacuate Lille was given him by the Minister for War, M. Messimy. It is stated that Reims was also evacuated, due to pressure of the civilian population. In the past there had been friction between Percin and Joffre which led to the former's retirement in 1913. Percin incurred the enmity of the clerical and the royalist parties as the result of his official actions while in the Ministry of War under André. Politics had a great deal to do with Percin's relief. He is no Chauvinist and is opposed to the alliance with Russia.

PERISCOPES

The working parts of the periscope (says Dr. Weichert of the Goertz optical works giving a description of the instrument in the year book of the *Schiffsbautechnischen Gesellschaft*) are carried in a heavy steel tube fixed to the steering tower of the submarine and strong enough to withstand the pressure of the water against it when the boat is moving. When not in use, the instrument can be lowered into the hull. The head of the periscope, which projects above the water, can be turned in any direction by a handle at the bottom of the tube. The magnifying power usually found in these instruments is 1.5. In very clear weather, satisfactory results may be obtained by throwing the image on a ground glass screen, thus relieving the strain of long continued observation using but a single eye. Recently designed periscopes have compass and range-finding attachments.

[Note. *Army & Navy Jour.*, Nov. 13, '15. 100 words.]

Periscopes are being used extensively in the trench warfare on the western front. Three types have been submitted to the Ordnance Department by the Frankford Arsenal. Samples of those now used in Europe show the Austrian to be the most convenient type.

—For Trench Firing

[A Periscope-fitted Rifle. *Arms and the Man*, July 29, '15.]

While it has always been considered that an infantryman and his rifle are much less efficient when the target is firing back, yet the reports from the English trenches indicate great coolness on the part of the men under fire. As an unwounded man is worth many times a wounded man, exposure should be discouraged, since the lines are usually so close together that a minimum of exposure requisite for aiming provides an easy target.

An Englishman has devised an additional gunstock which seems to be practicable, and attaches it to the rifle stock by means of leather straps. A periscope is provided, the actual alignment of the rifle being by the regular sights. Since the recoil is not directly against the shoulder it has been found that its effect is less noticeable than usual.

Of course there is a difficulty in operating

PERISCOPES—Continued

the bolt or recharging the magazine, but a machine gun so held is not open to these objections. The small exposure of the rifle affords a minimum sized target. The device is susceptible of many modifications.

PERU

—Military Conditions

[The Sierra of Peru. *Memorial del Estado Mayor del Ejército de Colombia,* Apr, '15. 4000 words.]

Major Pedro Charpin of the Chilean Army and honorary Colonel in the Colombian Army has given the results of his study of the Peruvian Andes in a conference of the General Staff of Santiago:

Natural barriers influence much the unity of a people. When they coincide with the boundaries, they are a source of strength, but when, on the other hand, they prevent free movement between different parts of the same country, national cohesion is more difficult to maintain. Chile, for instance, seems intended by nature to contain a united people, being contained between the Andes and the Pacific Ocean. Peru, however, falls in the class of states divided within themselves by natural barriers. The Andes, like a gigantic tumor, compress and trammel all the geographic sections of Peru. They materially isolate the northern regions from the southern provinces; they separate violently the valleys of the coast from the wooded regions of the east.

There results from the difference of elevation of the different parts of Peru a great variety in the racial characteristics of the people and in the spoken language. In the more important cities, the population is largely made up of mestizos. The white element is found among the employees of the public administration, in some families that own large plantations and among the foreigners in whose hands are the wholesale trade, the great mining enterprises and the incipient industry of the Sierra. The Indians have degenerated with time. They not only have not preserved the culture attained by the peoples of ancient Peru but they have lost even the memory of the works accomplished by their ancestors. Their necessities and manner of living are primitive. They cultivate enough to live on and to satisfy their passion for alcohol. Aguardiente is destined to produce in the Sierra the unification of races by a slow, but sure, destruction of the primitive owners of the soil. Compulsory military service will contribute to the elimination of the pure Indian, as a rather high per cent remain on the coast. From the civil and patriotic points of view, the Indian is a negative factor. He distrusts the white and avoids him. He is secretive and does not hesitate to conceal from the whites the presence of treasures of the earth and to suggest to him the existence of riches at far distant points. The Indian cultivates the soil by primitive methods and without recourse to irrigation. The steepest slopes are cultivated if they have a covering of earth. The Indian is of medium height and of great endurance on the march. He sustains himself *en route* by means of the anaesthetic properties of coca. He possesses in a high degree the gift of orientation by day or night in any kind of country. He is expert in packing animals and can himself transport considerable loads with greater rapidity than any pack animal. There are so many heterogeneous elements in Peru that only a common peril will be able to work the phenomenon of grouping them about one flag.

A campaign in the Sierra would be an exceedingly difficult task, and the brunt of the work would fall on the infantry. Its tactics will be characterized by a reliance on the initiative of the individual soldier, so great will be the dissolution of even the smallest units. The skirmisher will need all his skill to hit objectives having so much the advantage of position, and all his energy to advance under such conditions. The deployment of masses will be possible only in the high regions where the rivers head and in the low valleys. In this close country, machine-guns will have to be the main support of infantry. These mountains are not at all suited to the use of cavalry, and infantry will have to use its own means to keep itself informed. Even mountain artillery will find great difficulty in advancing opportunely and more yet in finding space enough to go into battery. Single pieces will have to be used. In the wider valleys, naturally, mountain artillery can be of great aid to infantry.

War, on such a terrain, will lose the character of struggles between regular armies. It will be primitive warfare and will be long drawn-out. Operations not contemplating a general beating-up of the Sierra will run the risk of being eternally prolonged. A series of parallel columns, advancing simultaneously, will furnish the solution.

PHILIPPINE INSURRECTION

[Aguinaldo's True Report of the Philippine Insurrection. By Maj.-Gen. G. M. Anderson, U. S. A. *Jour. Military Service Inst., U. S.,* May-June, '15. 6500 words.]

Recently Aguinaldo published what he claims to be a correct account of the Insurrection. He commences by stating that the abuses after three and a half centuries of Spanish rule had become so great as to be intolerable. He deals with the first insurrection against the Spaniards and the treaty of Biak-Na-Bato, by which he and his brother revolutionists were bought off for 800,000 pesos. He states that two Spanish generals were sent by the Governor-General, Rivera, as hostages for the payment of the money, but that after paying 400,000 pesos these hostages were released, whereupon Rivera did not pay another cent.

Aguinaldo differs in his account from numerous official reports of the occurrences at that time, and does not give the details of an agreement entered into with Consul Pratt at Singapore, but refers to the meeting with Pratt.

Isabelo Artacho, Secretary of the Interior of the Philippine Government at Biak-Na-Bato, created an interesting side issue when he claimed 200,000 pesos as his share of the bribe that the Spaniards paid to Aguinaldo.

Aguinaldo relates something of his negotiations with Admiral Dewey and his journey to Manila on the *McCulloch*. He says Dewey stated to him that the United States did not desire colonies, but would free the Filipinos from the yoke of Spain, and that the independence of the islands would be recognized.

The "Dictatorial Government" was established May 24, 1898, and immediately began military preparations, arms and ammunitions being landed under the protection of the American fleet. After the capture by the Filipinos of a party of Spanish marines, a celebration took place in Cavite, when the new national Filipino flag was unfurled for the first time; and as an evidence of good will, various officers and marines of the American fleet took part. Other Spanish detachments were captured, and on September 1, amid great enthusiasm, the Filipino flag was raised on a little fleet of eight launches and five larger ships in Manila Bay—the nucleus of the Filipino navy.

[Aguinaldo's True Report of the Philippine Insurrection. *Jour. Military Service Inst. U. S.*, July-Aug., '15. 6000 words. Concluded from May number.]

The German and French admirals in Manila Bay questioned Dewey regarding the use by the Filipinos of the new national Filipino flag, and the American commander informed them that such use was in recognition of the gallant attitude of the natives against the Spaniards, and that it had his sanction. Aguinaldo visited Admiral Dewey about the end of June, 1898, and when informed of this action understood it to be in recognition of sovereignty.

Expeditions were sent on various missions through the islands, always with the consent of Dewey, and the ships of the Filipino navy habitually saluted the American flagship and received salutes in return. [Character of salute not stated.—Ed.]

On June 12, 1898, the "Proclamation of Philippine Independence" was issued at Kawit, and Admiral Dewey recognized the event by sending his secretary to represent him.

The first American military expedition arrived July 4, and the commander, General Anderson, called on Aguinaldo, who immediately returned the visit; and in subsequent conferences, General Anderson ratified the promises made by Admiral Dewey, affirming that America's only purpose was to free the islands. Previously and subsequently to these events, the American naval commander sent his secretary to get permission of Aguinaldo's "Dictatorial Government" to place American troops in certain towns, and this permission was readily granted.

Dewey and Anderson afterwards visited Aguinaldo to renew their promises of friendship and support, and to ask forbearance of the Filipino soldiers for any petty acts of Americans. They also requested secrecy in regard to their conversations and arrangements.

A suggestion was made to Aguinaldo at this conference that the Filipinos of the city of Manila revolt, as had those of the provinces; and Aguinaldo informed the American officers that he had received, through a commission from General Augustin and Archbishop Nozaleda, an offer of a million pesos to cease his activities, but that the commission, being loyal Filipinos, had also informed him that they had been forced by the Spaniards to deliver this message, and that the natives of the city were ready to revolt if given arms. The Spanish Governor-General had offered autonomy, but the Filipinos wanted independence.

The American commanders expressed satisfaction with Aguinaldo's attitude, and requested him to form a plan of co-operation whereby the city of Manila might be captured by the combined military forces.

After the arrival of General Merritt with more American troops, the Americans occupied part of the Filipino trenches, and ten days later the Spaniards made a surprise night attack on an outpost, capturing some rifles, which the Filipinos promptly recaptured and returned as proof of friendship and co-operation. Shortly afterwards more American reinforcements arrived, and, by permission, occupied more of the Filipino trenches.

On August 13 the American forces attacked the walled city, and the Filipino troops took the largest part of the suburbs. The city surrendered to the Americans, and this fact was kept secret from the Filipinos until it was noticed that the Spaniards on the walls were not firing on the Americans. This secrecy was an infraction of the agreement between the allied commanders, and the beginning of discord.

General Merritt insisted that the Filipino forces withdraw from the immediate vicinity of the walled city, and in three separate notes agreed to negotiate differences later. He also sent a personal representative to emphasize his insistence. These requests were complied with, in the hope of later re-establishing the former relations.

Gradually the American attitude grew more distant, and, in October, Admiral Dewey seized all the launches of the Filipino navy in Manila Bay. General Otis was more formal than his predecessors, and hope of reconciliation was practically lost when it was learned that this attitude was by direction of President McKinley. There was still, however, a possibility that the American people would listen to the advice of Admiral Dewey and the other American commanders and grant to the Filipino people their long-cherished wish; and hope was renewed when the United States sent a civil commission with power to arrange a definite government of the islands.

During all of this time, Aguinaldo counselled patience, in the face of strong opposition from his ardent compatriots, and notwithstanding numerous acts of provocation, apparently officially sanctioned, on the part of American soldiers.

Impolitic acts of the American authorities are cited to show the difficulty of treating with the commission, and the proclamation by General Otis of sovereignty in the name of the United States raised the cry of "treachery" from the Filipino people.

PHILIPPINE INSURRECTION—Continued

Conferences were held between the Americans and Aguinaldo's government, all of no avail, due to lack of authority on the part of the local American authorities, though the latter made favorable recommendations to the Washington government.

On February 4, 1899, hostilities were suddenly opened by an attack on the Filipino lines. General Otis telegraphed Washington that the Filipinos had made the attack, and this telegram was debated in the Senate, with reference to the annexation of the islands as provided in the treaty of peace with Spain, and was instrumental in securing the ratification of the treaty without amendment.

Aguinaldo's report is dated Tarlac, Sept 23, 1899.

PIANELL, Gen. Salvatore

[General Pianell and the Instruction of Troops. By Capt. S. Pagano. *Riv. Mil. Italiana*, May-June, '15. 15,000 words. 1 table, 1 bibliography, and 2 examples of orders.]

General Salvatore Pianell held that camp life was the true school of the soldier. He was in command at Verona from Oct. 20, 1866, to March 20, 1892, when he reviewed the troops for the last time, preparatory to giving up active service. He died April 5, 1892.

He had been an officer of the French Army under the Bourbons and had risen to the grade of field-marshal. He was a native of Sicily and had spent many years there and in Calabria, which had made him familiar with the turbulent population and the life of the soldier. In 1859 the King of Naples placed him in command of the Abruzzi, a frontier region where a strong man was needed.

He went over the territory under his control, by vehicle, on horseback, and on foot. He examined into everything, and set about improving the condition of the people, by opening roads, establishing public institutions, and encouraging industry and trade.

He found the military forces in a deplorable condition, with barracks tumbling to pieces, hospitals poorly equipped, and magazines empty. Officers were lacking and the troops were idle. He recalled the officers from the diversions of the capital to their posts on the frontier, organized the troops, and ordered instruction, marches, and maneuvers. He brought his needs to the direct attention of the King and secured the equipments and supplies required for his troops.

But his stay on this duty was short. In 1860, upon the bursting forth of the red shirts under Garibaldi, Pianell was called to Naples by the king and was made Minister of War He advised the king to put himself at the head of his troops and attack the enemy, but the king preferred to take refuge in the fortress of Gaeta. Pianell gave up his post and retired to Paris.

In 1861 he entered the Italian army as a Lieut.-Gen. and from this time began his real work. His methods of instruction and discipline were based upon the experience of the past as found in history and upon his own profound knowledge of the soldier. He visited battlefields, fortifications, barracks, camps, and other points of military importance, to collect practical information. In 1865 he visited England, going several times to Aldershot to witness maneuvers, and examining the fortifications at Portsmouth. In 1867 he visited Vienna, Budapest, Brunn, Austerlitz, Sadowa, Prague, Dresden, Berlin, and lastly Stettin, where he saw the maneuvers. After 1870 he visited the new battlefields of the Franco-Prussian war. His published letters give the impression of a man veritably obsessed by sentiments of duty and honor.

He possessed a remarkable capacity for work, and had the faculty of inspiring a similar spirit in others. To discharge all his duties he worked fifteen and sometimes twenty hours a day. The efficiency of his labors was increased by his habits of order, regularity, and exactness, which caused everything around him to move like clockwork.

The Italian army had just been largely increased when he returned to the service in 1861. Further increase was made in 1862. Much confusion resulted from the increase, on account of disparities of education, experience, and rank among the officers of the new units as compared with those of the old. There were also great differences between the men in the ranks, and it was difficult to make a strong and capable mass from the old Piedmontese army, the Austrian regiments, the new Tuscan regiments, the Garibaldi militia, and the demoralized Neapolitan regiments.

The principal means for the training of troops were the camps of instruction at San Maurizio, Somma, and Foiano. The higher officers came in contact with the regiments by means of inspections. Pianell performed this work with minute care, keeping record of the qualifications of each officer, examining the property, the accounts, the records, and the funds of each regiment, making criticisms, and leaving instructions for the colonel.

The work in the camps of instruction consisted first in training in detail, by regiment, under the direction of the regimental commander. The second step consisted of combined evolutions of the three arms. But these operations were conducted largely as exercises of the drill ground and their success was judged principally by the quickness and precision with which troops were changed from one formation into another. To Pianell such exercises appeared mere play, having no value in preparing troops for battle. He began an innovation by taking the divisions under his orders on two maneuver marches of three days each, during which the troops performed actions of war rather than of parade. His ideas rapidly bore fruit. The next year he was ordered to conduct similar instruction with eight regiments of infantry, two battalions of *bersaglieri*, two regiments of cavalry, and five batteries of artillery. But Pianell's plans for a march of ten days with this large force came to naught when the camp was broken up and the troops sent to suppress disorders in Turin.

At the opening of the campaign of 1866, Pianell had command of a division. At the battle of Custozza his orders were to remain

on the right bank of the Mincio and prevent any sortie of the garrison of Peschiera. The stream of wounded and stragglers returning from the battlefield caused him to move almost his entire force, without orders, to the front, where he checked the pursuing Austrians and converted Custozza into a reverse instead of a disaster, for the Italians. The same night, after the battle, he took command of the First Corps.

At the close of the war he went to Verona as commander of the military department and later of the Second Corps. He remained at Verona the rest of his life.

He made himself familiar with the territory under his command by traveling over it by rail, by carriage, and more particularly on horseback and on foot, as he had done elsewhere years before.

The campaign of 1866 had brought out the defects in the coordination of the tactical use of the different arms on the battlefield. The old close and rigid formations had had their day. The basis of tactical action must be the company instead of the battalion and troops must go into action in open order. Substantial changes were introduced in the Italian army. The manual of arms was simplified, and useless and complicated movements of drill were abolished. A new element, the terrain, was introduced into the instruction of trops, and the formations, instead of being rigid under all circumstances, were adapted to the ground.

In 1869 maneuvers by the Second Corps were held in the vicinity of Verona under the direction of Pianell. Before they began, he had lithographed and distributed to all officers of the grade of captain or above, instructions for the execution of the maneuvers, and tactical memoranda for the same. These works contained his views on important subjects, such as orders, reports, concealment, and deliberation in action. The memoranda were taken largely from standard military works and emphasized the characteristic features of the three arms—of infantry, fire; of cavalry, movement; and of artillery, position.

At the close of each exercise, instead of having the troops pass in review, he gathered the officers and made a critical analysis of the operations. His report to the minister of war expressed his view that all instruction, even the most elementary, should be so given as to represent war conditions. Many of his ideas seem prophetic, they are so applicable to conditions now existing after the lapse of more than forty-five years.

In 1870 and 1871 he again held maneuvers on a large scale, giving attention to additional features, such as the handling of the trains. He gave great freedom of action to the commanders of opposing forces, interfering merely enough to give the exercises the general development that he desired, but he expected a commander to be able to say why he had acted in one way in preference to another.

He continued to develop this method of instruction until his officers were thoroughly grounded in its principles. The main features of his tactical doctrines form the basis of recent regulations. He gave great attention in 1869 to the matter of initiative, and his views were confirmed by the Germans in 1870. He gave each unit commander information as to the general plan of his side, but left him to develop the details according to the nature of the ground and the movements of the enemy. He considered it reprehensible for a commander, unless specially charged with a definite mission, to keep his troops inactive while the cannon were sounding. He required every unit, large or small, to keep connection to the right and left, and not to lose sight of the general situation by absorption in its own operations. He regarded an excessive extension of the battle front as a source of many evils.

His abilities stood the test of real war. After the defeat of the Italians at Custozza June 24, 1866, he joined the survivors of the First Corps in the middle of the night. Coming into headquarters he asked if the outposts had been placed. No one had thought of them. He took command of the corps, with orders to hold Volta. He remained up until 2 a. m., and at daylight was out again, mounted, making dispositions of his troops, clearing the roads, overseeing everything, reanimating everybody. The defense of Volta was made secure in a brief hour. In the retreat that followed, he enforced discipline and order, and had his troops pass through the villages to the sound of trumpet and drum. He made his corps famous for discipline, and for resistance to fatigue and discouragement.

He possessed a lucid mind, a clear conscience, a great store of military knowledge, an immense love of military institutions, a jealous care for discipline, and an indefatigable activity. One of his pupils calls him the greatest military educator of the 19th century.

PINTLE (Artillery Carriage)

[Patent Pintle for Artillery Carriages. By C. D. Magirus Co., Ulm, Germany. *Artill. Monatshefte,* June, '15. 1000 words.]

Pintle is jointed and consists of a pintle head which rotates vertically on the end of a bolt. The front of the pintle is a cam surface and slides vertically on a link plate attached to the middle rail of the limber. The bolt passes through the link plate. A compression spring is mounted on the bolt, keeping the link plate and cam surface of the pintle in constant contact. This arrangement limits the oscillations and vertical movements of the pole. The weight at the end of the pole is aways automatically balanced, permitting the weight of the pole on the horse's neck to be reduced to a mimimum whether limbered or unlimbered.

PISTOL

See also

CAVALRY—ARMS—PISTOL
CAVALRY—COMBAT—USE OF PISTOL IN

PLEVNA, Battles of

[The First Battle of Plevna and Our Manual of Instruction for Infantry. By Maj. Etchichary. *Revista Militar,* Mar, '15. 2100 words. Sketch of Plevna.]

Brief discussion of General Schilder's attack

PLEVNA, Battles of—Continued

on Plevna, July 20, 1877, in the light of the present Argentine Field Service Regulations.

In the Northern Sector of attack, the Russian commander neglected the cardinal principle which requires a thorough knowledge of the enemy's strength and disposition and of the terrain before joining in a decisive action.

The Russian artillery—far from annihilating the enemy's infantry in preparing for the Russian infantry attack, did not support the infantry and thus failed in its principal mission.

The infantry in the attack advanced in a single line without supports and reserves and attained a temporary ascendancy over the Turks by its splendid morale, but, instead of screening itself in the Turks' abandoned advance position and preparing its attack by artillery fire against their main position, it rushed blindly on and was driven back with slaughter.

The commanding general threw in practically his whole force at the outset, and did not retain a sufficient reserve to throw in at the critical stage of the attack. He did not protect his right flank, which was in the air, against envelopment.

In the eastern sector, the 19th Infantry Regiment took successively three lines of Turkish trenches and continued its advance up to the Grivitza Redoubt, but was finally cut to pieces by a battery of Turkish artillery in Plevna and driven back by Turkish counter-attacks, there being no Russian reserves at hand.

See also

European war—Military lessons of the (Article: Flanders and Plevna: a comparison)

PORT ARTHUR, Siege of

[The Operations Around Port Arthur. The Official Version of the Japanese General Staff. Translated by Captain W. T. Hoadley, U.S.M.C. *Proc. Nav. Inst.*, Sept.-Oct., '15. 19 pages. Sketch-maps.]

[This instalment gives an account of the seventh and eighth (naval) attacks on Port Arthur. On account of the detail, reference must be made to the original.]

PORTUGAL

—Army

See

Fortress artillery—Training and Maneuvers—Portugal

POSTAL COMMUNICATION

See

Field post

POWDER

See also

Explosives

—Smokeless—Manufacture of

At present there are no important powder secrets, though each nation keeps careful watch on the others in this respect. The United States government uses annually about 4,000,000 pounds of cotton to make powder, and has about 40,000,000 pounds ready for an emergency. France had 450,000,000 pounds in store at the outbreak of the European War. The United States powder is made in factories in Delaware and in the government plant at Indian Head on the Potomac River. In France, powder-making is a government monopoly, and that nation's product is considered less effective than that of some of the other nations. Germany secures its powder from private manufacturers, which puts it in the advantageous position of having many factories to draw from in war time.

[Note. *Army & Navy Jour.*, Oct 16, '15. Quoted.]

An important discovery by the du Pont Powder Company was reported on Oct 7, whereby the time required to manufacture smokeless powder is greatly reduced. Under a method just adopted the drying process now takes only five days instead of sixty days as heretofore. Only twenty-one days are now required to turn out the finished product. This is an outcome of experiments made by the company's chemists and is the cause of the tremendous production of explosives at the Carney's Point (N. J.) plant, where about 15,000 men are employed.

PREPAREDNESS FOR WAR

[The Growth of War. By Professor R. M. Johnston, Harvard University. *Infantry Jour.*, Sept-Oct, '15. 5000 words. Table.]

Aside from a few European countries, war is a comparatively unknown subject. It had no place in the old education and was very rudimentary on the intellectual side. Conditions during the past 150 years have changed with great rapidity. Economic progress, development of rapid communication, the increase of wealth and the nationalization of armies, have created conditions which from their size and complexity demand greater intellectual training and greater effort than is put into any other phase of human activity. In a few countries, the technical methods of war are studied. War is to them a science. England and the United States ignore the intellectual side of war, fondly believing that boys of 20 can be taught to handle arms at their respective military academies. A boundless and versatile ignorance is shown by us in the matter of most import,—that of maintaining our existence. Save a few sporadic efforts, there is in this country no true study of military art. England's dilemma at the present moment is due to just one factor,—her lack of training. A huge technical job requires technical experts, and her officers, grade for grade, have not the training of the German officers. A tabular statement of the national military effort of each nation will show the great superiority of the trained German over the semi-trained Englishman and the untrained citizen of the United States. Surely scientific study and scientific training are the only secure and economical foundations upon which to build.

About 1750, with no grain imports, no capital, and no supplies except local, armies were small, primitive, less costly and less mobile. The rule in those days to protect a city was

to camp first in the vicinity and eat up all supplies; the enemy would have to go elsewhere to maintain himself.

The above strategy was General Lee's in '62 and '63, as can be seen by marking a map of Virginia with the consumed and unconsumed food areas. War then was slower and less destructive. Armies were so small that one destructive volley might decide the battle and one officer might control from the saddle a whole battle. There was of course no necessity for scientific training or systematic staff work. Prussia alone trained her officers; other countries allotted posts according to rank and influence of the recipient. Then it was the soldier who counted, now it is the organization, the material, and the technical training of the officer which determine almost everything. The periods 1763-1792 and 1792-1915 are periods of great change. A sudden expansion of trade and population and the beginning of the industrial revolution meant improved transportation and material. Revolutionary improvements were made in field artillery, and the zone of fire was so deepened, so intensified, and so recognized, that revised tactical theories of the three arms were taught by the French before the beginning of the war in which they were to find their application. Thanks to Prussia, it was discovered that being born a gentleman was not a sufficient qualification to handle troops, but that a special education was needed.

Success in war is always the solving of a psychological problem, either of the soldiers collectively, of the commander individually, or of the political power behind the commander. The French Revolution shows for the first time in modern history, this political power actuating armies in the field. The greater the energy and the will power, the more national the effort, the greater the probability of success; and the French Revolution showed a collective national will unequalled by any until the present marvelous display by Germany.

Armies of today must tend toward success or failure in pretty direct ratio to the national spirit that stands behind them. In the present international struggle for bread and dollars, the most courageous community and the most enduring has the greatest chance of success. Individuals may escape the penalty of cowardice; history shows no such example for a nation. The increase in the size of armies about 1800 created problems, soluble only by scientific organization, by the creation of bodies of trained experts, in other words by an intellectual effort and by education. Napoleon's one-man policy was not that of Prussia, whose successive bodies of experts built the efficient machine of today. This growth, be it noted, rests upon a full hundred years of intellectual effort. How fallacious to think that war can be waged by a million volunteers. We do not need these millions, but thousands of technical experts in the art of twentieth century war. The German General Staff today handles its forces on a front of 2500 miles with as consummate skill as Frederick showed on a front of 2500 yards, and it can fool the opponents just as he did The result is reached by the operation of groups of staff officers concerned with intelligence, with operations, with transportation; by the calculations of strategists who have spent their lives in the study of military history and theory; by playing on networks of railroads with the sureness and flexibility of a Harriman; by tabulating economic statistics; and by securing in all these perfect harmony and smoothness of action. The best armed civilizations are shown by history to be the ones which last the longest. Our predecessors here were horrified, no doubt, at the muskets of the Puritans, and more fatal still, could not cope with them using bows and arrows. We are horrified at the gas tubes of the Germans; are we to remain as helpless as the American Indian did before us?

On the whole, the strife for money and for external happiness, the substance of human effort, does not tend to reduce the probability of war. The fact remains that modern war demands greater study and skill than ever before, and unless the art of modern war be studied as carefully as the art of conducting a great industrial enterprise, the community can stand no chance at the final arbitrament.

[Random Notes on Military Shooting. By Ralph W. Seiss, M.D. *Arms and the Man.* 900 words.]

(The author pays his respects to the conceit, ignorance, and arrogance of our people in respect of preparedness. Although "popular" in form, his remarks are sound and contain much wisdom.)

See also

MOBILIZATION

Also subhead MILITARY POLICY *under names of specific countries*

—Effect of wealth and moral factors

[The Military Efficiency of Nations in Relation to Wealth and Moral Factors. By Bertucci Enrico, First Auditor of the War Department. *Riv. Mil. Italiana,* June, '15. 11,000 words. Several tables of population, wealth, commerce, and expenditure.]

Force does not create right, but defends it. Without force, right becomes a mere abstraction. National force is the sum of all the physical, economic and moral powers of the state.

Wars are no longer fought because of religious differences or the ambitions of princes; they arise nowadays almost entirely from economic conditions. War is only one manifestation of the struggle between nations. It is often merely the continuation of a struggle that has gone on in time of peace.

All armies that have accomplished great things have been a long time in preparation. Alexander inherited his army from Philip, as did also Frederick the Great from Frederick William I.

The army with which Napoleon overran Europe came into his hands already formed and inured to war by the Revolution. Peace does not signify the absolute cessation of all military activity and growth.

PREPAREDNESS FOR WAR—Continued

The preparation for war involves heavy expenditures, and the more prosperous a state is, the greater the quantity and the better the quality of the instruments of war it is able to furnish to its combatants. From the earliest times there has been a tendency in rich states to entrust war to mercenaries, but this second-hand defense of a nation is fraught with grave dangers. The remedy is a more general diffusion of military training among the citizens.

The limit to which a state can go in military expenditure depends on its economic condition. In Europe the population is increasing, but wealth is increasing much more rapidly, and the military development has kept pace with the wealth rather than with the population. The result is that the modern army is of immense size and requires the most careful and minute preparation during peace for its use in war. This involves not only the preparation of arms and equipment, and the construction of railroads, but also the moral preparation in the virile education of the youth of the nation in discipline and in love of military institutions.

In time of peace a nation accumulates wealth and is thereby able, when the need arises, to make the efforts and sacrifices necessary in war. The important thing is to be able suddenly to arm large numbers of men, to have capable officers ready, and to have the command and administration well organized. The relative ability of nations to accomplish these steps may be measured roughly by considering the various factors that enter into the problem.

The first factor is population, upon which depends the production of wealth and the creation and accumulation of capital. The second factor is the soil, to be considered as to fertility, minerals, climate, and access to markets. The third factor is the moral factor, which depends largely upon the past achievements of the nation. These factors are to be considered in connection with labor, which Adam Smith calls the basis of the wealth of nations. Labor is judged by its efficiency in agriculture, manufactures, and commerce.

Eliminating the secondary factors, the past history of the nation, its character and customs, we have as the principal factors population, soil, finance, industry and commerce. The last four of these may be combined into one factor, annual production, or better still, annual increase in wealth. The absolute wealth of a nation gives its present economic power; the annual increase gives a clue to the future. The annual increase is also a measure of the enterprise and initiative of a people. For example, Germany makes better use of her capital than France, whose wealth is greater but is partly an inheritance from preceding generations.

National wealth is the sum of public and private wealth. Public wealth includes the public domain and the private domain possessed by the state and by local authorities. Private wealth includes the possession of individuals and of societies and corporations of all kinds.

There are many difficulties and uncertainties in computing private wealth. De Foville takes the amounts transmitted by inheritance, donation, dowry, and settlement by parents, upon children, for one year and multiplies this by the average duration of life. Other statisticians make a direct calculation of the value of real estate and personal property based upon the tax rolls. In countries where there is an income tax, calculations can be based to some extent upon it.

Tables prepared in accordance with these principles show Italy to be deficient in wealth in comparison with other leading European nations, but they show the wealth of Italy to be increasing rapidly. This is due to increasing production in various forms of industry, activity in commerce and arts, and better conditions and pay for labor. France is increasing reasonably in wealth, but very little in population. Germany is increasing very rapidly in both wealth and population. The lines of communication by rail, telegraph and telephone and the value of exports and imports are important features of the economic power of the state. The tables show a comparison of these items in the European countres.

The military power of a state depends upon the number of soldiers, the materials of war, the rapidity of entrance into action, the physical and moral education of the troops, and the geographical configuration of the country. It is impossible to-day to improvise an army. Preparations must be made in advance and they must be kept up-to-date with the most modern equipment, armament, and supplies. It is important that industries should be developed that will supply the needs of the army in war. Rapidity of mobilization is of the highest importance. On the outbreak of war the armies will be raised to at least five times their peace strength and the fate of a campaign may depend upon rapidity of concentration. Even numerical inferiority may be counterbalanced by this. The training of troops must fit them to stand privation and fatigue, changes of weather and climate, and reverses on the battlefield. The effect of geographical conditions on national policy is illustrated by the case of England's small army and large navy. Italy, with important states on its frontier and a coastline of about 7000 km., needs both a large army and a large navy.

Some authorities measure the military power of a nation by an algebraic expression which is the product of three factors—the number of men mobilized at the menace of war, the length of time these men have served with the colors, and the actual value of military materials on hand. Another method is to compare the expenditures of various nations for military purposes. Instead of comparing total expenditures for military purposes, the comparison may show the relation such expenditures bear to total national wealth, or show the expenditures of different nations per capita of total population.

There must be a reasonable proportion between the economic resources of the state and its military expenditures. Too great an expenditure in peace would leave the nation weak

in war. On the other hand, it is more economical to spend hundreds in preventing an evil than to spend thousands in repairing the consequences. Prudence must sometimes give way to necessity. A sick man buys the best medicine if he has the money; if he buys cheaper medicine to save money, and dies, he merely commits suicide. The errors committed by France during the second empire were paid for dearly. They resulted from a lack of harmony in the two essential functions of social life, the productive and the defensive, the civil and the military. Society is either in a state of war or a state of peace; no social arrangement is good if it operates in only one of these conditions.

The political edifice ot Rome rose and stood because Roman wisdom and virtue were neither civil nor military exclusively. The matter is summed up in the Latin sentence: "If you wish peace, be ready for war."

—Effect on social life

[Military Institutions in the Development of Social Life. By I. Libertini, Capt. Inf. *Riv. Mil. Italiana,* June ,'15. 6500 words.]

The majority of people, absorbed in the private affairs of their daily life, have neither time nor inclination to consider social phenomena. Social benefits and social ills may be considered the resultants of the necessary restrictions and compromises of life. Even the liberty of the individual, in its best sense, can exist only in connection with strict respect for the liberty of others.

At present there is a great outcry against war, as the greatest evil of life, and against militarism, which has cast its shadow over the world.

The word militarism is used to signify the prevalence of brute force over right, of the military over the civil power. It appears necessary to correct this wide-spread opinion and to point out its inconsistency and its dangerous tendency.

Military institutions represent national force, and force has been a necessary part of all government, among the most civilized as well as the most barbarous nations. But there seems to be a belief that force seeks to pass beyond its proper bounds, that it has a natural tendency to degenerate, and that its ultimate form is militarism.

The military institutions of a nation depend upon its wealth, power, location, social condition, and other factors. England maintains a large navy and a small army and is opposed to conscription. It resembles ancient Carthage. Switzerland, with no sea coast, surrounded by great powers, is financially unable to maintain a standing army, but gives every man a soldier's training. The United States of America shows a very small military development in proportion to its greatness and wealth. The Balkan states, even in their poverty, have developed great military strength. Germany shows what can be done by a nation that gives its whole soul to the development of military power.

The Roman military force, once so virile, became corrupt and degraded, but this was not the fault of military institutions in themselves; it was an accompaniment of the general corruption of Roman life. Many nations have suffered internal disturbances that were not in any way chargeable to militarism. Even England, in recent years, has had the trouble in Ulster.

To-day more than ever the army of a nation is closely linked to the national life. In case of war the whole force of the nation may be called to participate. The spirit of military service is essentially altruistic, the spirit of privation, of sacrifice. It is a false idea that the army wishes for war, and tries to draw the nation into war.

All history teaches that the greatness or the decadence of a nation is intimately connected with the greater or less elevation of its military institutions. If there is a deep and general altruistic spirit in the nation, this gives life and vigor to its military institutions; if private interests are uppermost in the nation, the result is not only to weaken the military spirit but also to tend toward the disruption of society itself.

Nations are subject to periods of exaltation during which they have an unusual tendency to assert their power. This is recognized in the phrase, sacred national egoism, recently much in use. When such a feeling in one nation encounters a similar feeling in another nation, the result is war for the preservation of national integrity and development.

The dream of universal brotherhood has disappeared for the present, and there is no disputing the necessity of military force. But it is not sufficient to hurrah for the army when the enemy is at the gates. It is necessary to cultivate military strength as one cultivates strength of body in order to keep it vigorous and ready to meet the ills that beset it. An obscure destiny awaits any nation that takes a superficial view of international relations, and cultivates weakness of spirit and will.

Force is the soul of the world and of the universe. Right, which does not exist in nature, is an invention of the human mind. Those who have such a regard for the right, forget that no right has ever existed that was not supported by an adequate force.

—Responsibility for

[The Responsibility for Unpreparedness. By Lt. Col. W. H. Hart, U. S. A. *Jour. Military Service Inst. U. S.,* Sept-Oct, '15. 1500 words.]

The hope that immunity from war may be secured while in a condition of national unpreparedness having been shattered by recent events, it becomes necessary to decide what may be done to safeguard national life.

Although a virile people will resist to any length the efforts of an alien power to act the rôle of master, it has become obvious that successful opposition to skilled and equipped armies cannot be made by mere masses of men.

There can be no quarrel with those whose convictions set them against practical measures, but it seems habitual for them to ignore a vital principle; though they know what they would do under any assumed conditions, they do not have such knowledge of their oppon-

PREPAREDNESS FOR WAR—Continued

ents. Neither can they so radiate their principles as to insure reciprocation. If, as in a recent instance, an armed and powerful nation cannot induce another to join in a policy of reduction of armaments, it is not reasonable to expect that terms may be dictated to an armed opponent by one that is unprepared to strike.

Among the people of any country there may be found a minority who do not grasp the facts and learn the lessons of history, but the majority live under no delusions and are justified in demanding proper forethought and action on the part of those charged with the welfare of the nation. For these the problem is how to stimulate action towards the right end. Responsibility is a key to action, a constant spur to delinquents. There are various forms of government that make it difficult to fix responsibility for neglect leading to spoliation by an armed aggressor. This condition is most likely to arise in a new country whose policies have not taken shape. In older countries the dividing line between the duties and responsibilities of governmental departments is more plainly marked. In democratic countries where the thought of inherent equality among men has taken deep root, that other thought of equality in acquired knowledge sometimes becomes a menace. It is fallacy to believe that one who has devoted his life to a certain calling can step at once into another and become a master.

The responsibility for national defense lies between two departments of government; first, that which is the repository of expert knowledge as to the needs of the country from a military point of view; second, that which holds the purse strings and makes effective or ineffective the measures worked out by the war minister and his assistants. The lines between these branches should be clearly defined, but the tendency is to confuse responsibility.

The title of minister of war should imply that its holder is not a mere beneficiary of politics, but a man grounded in the professional requirements and measuring up to the standards of statesmanship. With such a man as war minister, aided by a corps of experts, there should be no need for entertaining vagaries regarding war and preparedness for war—vagaries of men skilled in their own professions but ignorant of the problems of military preparation. It is not the province of the professional soldier to decide whether the country shall be equipped to protect itself; the people must decide this. If they decide for protection, the soldier should determine the methods.

When a nation which finds itself whipped into submission to foreign will attempts to fix the responsibility, the guilty will escape through any avenue that offers. The war office will justify itself upon the lawmaking branch and vice versa, if the record permits. So let the record be plain; fix the responsibility so clearly that it cannot be divided.

If guilt be fixed, it will be inadequate to impose individual punishment; to be effective the punishment must be upon a broad scale. Its threat must be directed at the foundations of the great political organizations. Political parties are averse to destruction and they will obey the will of the majority if emphatically expressed.

The realities of this world cannot be dispelled by a wish or a thought. The example and teachings of the Nazarene did not end war. The taint in human nature which drives individuals to possess the goods of others is still alive, and its influence is active except when curbed by laws. In a brigand nation this taint becomes a monstrous contagion and for such there is no law. The fact that brigand nations may exist makes it useless to discuss the moral points. When likely aggressors cease preparations for aggression, likely victims may cease counter preparations.

This problem is for people who could never yield to alien coercion. It follows that such coercion attempted means a quick appeal to arms. The solution lies in such elementary preparedness that an aggressor may not be able to crush all resistance at the first blow. This solution can be helped by a nation-wide determination to make escape from the consequences of default in public service more difficult.

PRESS CENSORSHIP

—In Wartime

[The Press in Time of War. By Capt. Frank Geere, C.A.C. *Jour. Military Service Inst. U. S.* Jan-Feb 1915. 5500 words.]

American newspaper correspondents are a necessary concomitant of our military forces in time of war. The precedents now being set in Europe, of eliminating them entirely, need not be followed by us, but we recognize that their regulation in the field is both practicable and practical. Censorship in time of war will be the duty of the War Department.

In Germany, due to the predominance of the military, the press affords no problem, nor indeed in France. Germany forbids correspondents, France issues to them no license, and England permits twelve—to remain in London.

Newspaper men now acknowledge that the day of glory for correspondents has passed. In the western theatre of war in Europe arrests and punishments are frequent for those daring news gathering, and expulsion always follows. Belgium is the only country that makes any exception to this rule—hence the stories coming from there.

Correspondents are particularly dangerous in the matter of reporting morale, character of units and leaders, and state of supply; and here the censorate at home becomes valuable. In addition the home censorate keeps down information of reinforcements, letters from wounded, state of base supplies, etc.

The censorship is important from the critical days preceding the outbreak of hostilities. With a nation like France or Germany, wholly under arms, the suppression of an offending newspaper is easy, but with countries like England and the United States, having numerous routes of trade and communication always

open, the task is not so easy; yet England moved 100,000 men to the continent without any news of it reaching the public. To the press itself belongs the credit for this extraordinary silence. It willingly surrendered its power for the good of the nation. The government was unprepared for the exercise of censorship, and the press itself was the governing factor in the matter.

This attitude of the English newspapers was the result of a movement begun in 1905, and perfected by the press organizations themselves. Lord Kitchener has expressed the appreciation of the War Office for this action of the papers.

All the land lines in England are government owned and operated, thus rendering the application of additional censorship measures easy. The censorship was, at first, exercised by the "Official Press Bureau" and the "Censorate." The first communicated to the press all official information through a uniform channel, and the second handled telegrams and press articles. These offices are now consolidated. Several branch offices were formerly open, and confusion resulted, but now all matter is handled in a central office, though the defects are still evident. The whole illustrates the cardinal principle that preparation must be made before the emergency comes.

In the United States the extent and character of the country and the heterogeneous character of the press make our problem difficult. Cable communications with the outside world are not concentrated and land lines are privately owned, hence the chief lesson to be learned, viz.: preparation in time of peace—is about the only one of exact application to us. We must restrict the correspondents in the theatre of war and take some action towards forming a censorate at home. Although the constitutional provision prohibiting any abridgement of the liberty of the press may be a legal stumbling block, yet certain limitations having already been placed on the press, it seems that when the national safety demands, other limitations might well be prescribed.

PRISMATIC COMPASS

—Errors of

[The Prismatic Compass and Its Errors. By Temporary Lieut. H. S. Rowell, R.G.A. *Jour. Royal Artillery,* June, '15. 1500 words. Diagrams.]

However perfect and expensive an instrument may be, it has imperfections and its use develops errors which if understood, inaccuracy is easily avoided.

All errors in instrument work may be divided into three classes:

1. Constant errors.
2. Proportional errors.
3. Accidental errors.

Constant errors are due to:

(a) Faulty setting of the magnet with reference to the card;

(b) Lack of coincidence of magnetic and geometric axes of magnets;

(c) Displacement of pivots from line of sight;

(d) Incorrect setting of prism.

Of these, (b) is of least importance and (d) usually is negligible. Errors (a) and (c) usually are small in new compasses but they increase with wear.

The proportional errors are due to:

(a) Eccentricity of pivot cup with reference to the dial or card.

(b) Pivot friction.

The accidental errors are:

(a) Personal errors due to carelessness, inadvertence, varying health or eyesight of the observer.

(b) Local magnetic disturbances.

PRISONERS (of war)

See also

EUROPEAN WAR—PRISONERS

PROJECTILES

See

TORPEDO—AERIAL

—Smoke-tracing and Illuminating

[Krupp Smoke-tracing and Illuminating Projectiles. *Mem. de Artill.* (Spain), April, 1915. 1000 words, 6 figures.]

(Contains a description of two forms of smoke-tracing projectiles and of an illuminating projectile. It is impracticable to describe these projectiles without reference to the figures.)

PSYCHOLOGY OF COMBAT

[Psychology of Combat. By General Carlos de Campos. *Boletim Mensal do Estado Major do Exercito,* Feb, '15. 1200 words.]

Two thousand Italian veterans of the Libyan campaign were interrogated confidentially, one by one, as to their psychological experience to determine what fundamental psychic stimuli actuated them in battle. They all replied: "I advanced because my Lieutenant advanced." They all likewise stated that their most terrible experience was to stay in trenches, exposed to hostile attack, without being permitted to move.

Mass psychology teaches that an army is, first of all, a crowd of heterogeneous elements, in which a spark of excitement suffices to make a sudden metamorphosis whereby the thousands of individuals become a single monstrous, wild beast, proceeding toward its objective with irresistible finality. Only the moral force of a chief can control this transformation. Each race has its own peculiarities in battle psychology—save the cold discipline of the Prussian; others, the impulsive intrepidity of the Latin; still others the improvidence of savages and the indifference to danger which springs from a fatalistic philosophy. The leaders whom the men in ranks follow and from whom they take their psychic inspiration are their company officers.

RAILROADS

Asia Minor

[Turko-Asiatic Railroads. *Memorial de Ingenieros,* Madrid, June, '15. 500 words.]

Notwithstanding the great European war, the construction of the Bagdad railroad has been pushed, and the completion of the work in the Taurus region will unite Constantinople

RAILROADS—Continued

with Aleppo and the Egyptian frontier through Syria.

In 1888 German interests undertook actively to push the construction of a railroad system in Asia Minor, and since that time various German enterprises have extended the lines towards the Persian Gulf; and, to the astonishment of everyone, the work has been vigorously prosecuted since the beginning of the war. A railroad communication is now nearly completed to dominate the military situation on the Suez Canal.

Switzerland

[New Electric Traction Lines. By Wilhelm Gerabec, 1st Lieut., Austro-Hungarian Railway Regiment. *Mitteilungen über Gegenstände des Artillerie und Geniewesens.* Feb 1915. 8000 words, 1 sketch map.]

About a year ago, two great electric traction lines, the Mittenwald and the Lötschberg, were thrown open to traffic.

The Mittenwald railway runs from Innsbruck via Garmisch Partenkirchen to Reutte, a distance of 105 km.

The road is standard gauge, single track, with numerous sidings. The maximum grade is 36.4%, the minimum radius of curves, 150 m. The line passes over a number of large bridges and viaducts and through tunnels aggregating 4305 m. in length. It was originally proposed to use 10,000 V. current, but 15,000 V. was finally decided upon. Since it was thought impracticable, for various reasons, to supply the line direct from the generators, the current of 3000 V. supplied by each generator is first transformed to 50,000 V. and then supplied to the line through two sub-stations located respectively at Reith and at Schantz, 56 km. apart. The water in the Ruetz brook is used for generating purposes. Alternating current is used, the wire being carried on frame towers placed at intervals of 80 m. The feed wire is likewise carried by these towers.

The Lötschberg railway runs from Brieg to Spiess, a distance of 73 km.

The road is single track, standard gauge. The maximum grade is 27%, the minimum radius of curves 300 m. The line passes over a number of large bridges and through tunnels aggregating 26.3 km. in length, the one at Lötschberg being 14,606 m. long.

Single phase alternating current of 15,000 V. is used, water power being employed for generating purposes.

—Hospital Trains

See

SANITARY SERVICE—TRANSPORTATION OF SICK AND WOUNDED—HOSPITAL TRAINS

—Military Control of

Germany

[German Railways in Wartime. *Scientific American,* July 3, '15. 300 words.]

Since the beginning of the war all German railways, as well as those in conquered territory, have been under military control and operation. This facilitates prompt movement of troops and prevents waste of effort.

All this has been done without seriously interfering with ordinary passenger traffic, even with the fast trains, but freight traffic is entirely subordinated to military needs.

—Strategic

[Germany's Strategic Railways. *Review of Reviews,* May, '15. 900 words. Map.]

The railway system of Germany comprises 37,000 miles, and is more extensive than the French system, though about equal in ratio of length to population. Double-track railroads are more numerous in Germany than in France, and some have four tracks. The chief difference, however, is the extensive development of cross-connecting railways, stations and loading platforms in Germany.

The most numerous and most important railways cross Germany from east to west. Fourteen lines cross the German frontier between Switzerland and Holland, with two parallel cross-connecting lines, one on each side of the Rhine.

The whole system permits rapid concentration along the Rhine, and easy shifting of forces to any desired point along the frontier. A number of smaller lines lead from the interior of Germany to the Rhine. The supply of rolling stock is ample. It is calculated that an army of 100,000 men could be transported from one frontier to the other in two days.

(NOTE.—Comments on an article in *La Nature* by Victor Cambon.)

[Remnants of War. Railroads. By Jose Paulo Fernández, Captain of Artillery. *Revista de Artilharia,* Aug, '15. 3200 words.]

For a complete and perfect application of a system of national preparedness, it is necessary that due consideration be given to the railroads. The development of railroads and the building up of national defenses go hand in hand. It is obvious that lack of the former impedes the full use of all other means of national defense.

The railroad systems should be established and organized in time of peace, and all methods and points of mobilization decided upon, as well as all details of handling troops and supplies. In time of war, the railroads give life to armies, provide food, clothing, materials and munitions rapidly. They give freedom and vigor in the movement of large bodies of troops, remove sick and wounded rapidly, deliver reinforcements promptly. In fact the railroad is indispensable in utilizing a nation's forces to their greatest capacity and with the maximum effect.

The war of 1859 was the beginning of the use of railroads for the service of armies. The service was new and it was employed timidly. Its use was confined almost exclusively to the transport of troops. During the War of Secession the U. S. employed the railroads regularly and developed a special corps for this work.

Germany has a highly developed and brilliantly organized Military Railroad Service. The entire system was divided, in time of peace, into 26 military groups, called *linien.* They had on hand at the outbreak of hostilities all material and rolling stock necessary for the transportation and concentra-

tion of men, animals and materials. Tables for the dispatch and conduct of trains were all ready. The system for handling sick, wounded and prisoners, was carefully worked out. The principal reason for the superiority of the Germans over their adversaries was that their railroad systems were perfectly organized, allowing them to mobilize much more rapidly and giving them greater mobility in operations. The Germans have the most wonderful military railway system of which it is possible to conceive. It might almost be said that their plans of war consisted of the judicious and intensive development of their railway systems. There are nine railroad lines, each absolutely independent of the others, operating in the province of Lorraine. Seven days was the maximum required to put all the first line troops on the frontier, and on the tenth they invaded France.

On the west front the great bases are Düsseldorf, Cologne, Coblentz, Mayence, Mannheim, Strassburg, Freiburg and Leopolsche.

The bases on the east front are Danzig, Thorn, Posen, Ostrowa, Breslau, Myslowitz, and Cracow.

These great bases are linked in all their enormous extension by 800 kilometers of line separate from the nine great lines connecting the two fronts.

The Austrian railway system is modeled after the German, being constructed with the primary object of their military value and usefulness.

Some years ago the Russian railway system was altered. At the beginning of the war they had eight lines of concentration, six of which were double track and supplied with all material necessary.

France had her railroad service well organized and almost all the materials and rolling stock required was on hand. The railroad service was divided into two divisions of subservices: 1st, Transports over the interior system, and 2nd, Transports over the army systems. The interior system receives orders from the Minister of War and the army system receives its orders from the Commander in Chief of the Army only. To insure the normal functioning of these services, "Regulating Stations" were established in regions of notable importance and in favorable situations. An officer of the General Staff had charge of each of these stations. Having helped in the preparation of the general plans of mobilization, he had a perfect knowledge of the conditions to be met.

Rapid transportation of artillery and its prompt entrance in great masses into the conflict is possible only if railway facilities exist and are used. When Paris was threatened, the French brought an entire army from the south in a few days.

For plans for the organization and building of railroads as a protection against aggressive action on the part of Spain, reference must be made to the text.

RANGE-FINDING

[Selection of Aiming Points. By 1st-Lieut. Wenzel Halbich, 21st Austro-Hungarian F. A. *Mitteilungen des Artillerie u. Geniewesens,* Mar, '15. 1500 words. 2 figures.]

Aiming points on a flank or far in front or in rear of a battery are frequently considered the best, but it is overlooked that while such locations have some advantages, errors in deflection result from the errors made in determining the distance between B. C. station and aiming point.

As targets appear and disappear with startling suddenness nowadays, range finders will have their hands full and the distance to the aiming point will have to be estimated. As an error of 20 per cent is generally made in this, it is obvious that the firing data will show a corresponding error, which can only be eliminated by proper selection of the aiming point.

If the distance between B. C. station and aiming point is correct, the B. C. will be able to determine the correct angle at the directing gun. If an error of 20 per cent has been made in measuring this distance, however, a corresponding error will be made in the angle mentioned, and the deflection given the guns will be in error by the difference between the correct and the incorrect angles.

Let us assume that the correct distance to the aiming point is 6000 m., that the error in estimating this distance is 20 per cent, that the base is 500 m., and that the correct angle B. C. station—directing gun—aiming point is 80 degrees. Then the resulting angular error will be 1° 12′ 49″, or about 21 mils. At a range of 400 m., this would throw the shots 88 m. wide of the target.

The angular error at the directing gun decreases as the distance between B. C. station and aiming point, as well as the angle at the B. C. station, increases. The angular error mentioned becomes zero when the angle at the B. C. station is 180 degrees. Therefore, the greater the distance to the aiming point, and the closer that point lies to the line directing gun—B. C. station prolonged, the better, the best location being on that line, because in this case, whatever the distance between B. C. station and aiming point, the angle at the gun must be zero.

See
BALLISTICS
CHRONOGRAPH
Also subhead RANGE-FINDING *under* ANTI-AIRCRAFT ARTILLERY
COAST ARTILLERY
FIELD ARTILLERY
SIEGE ARTILLERY

—Instruments

[The Range Finder. *Scientific American,* Jl. 10, '15. 1000 words. Diags.]

Range finders are of two types: the double observer and the single observer classes. The principles are the same. In the first type two instruments, with a cord between as a base, are used, and in the second a single instrument contains the base.

The British use the Mekometer, a double observer instrument, with a normal base of fifty yards for artillery and twenty-five yards for infantry. It has been found difficult to use where there is lack of cover.

In the one-man type there are two systems,

RANGE-FINDING—Continued

an erect and a vertical image. The principles of the mechanism are the same, prisms reflecting and refracting the rays and the right-hand prism being turned by hand to bring the two images into coincidence vertically, the images being separated by a faint horizontal line.

—Measurement

[The Measurement of Distance in War. Translated and abstracted for *Scient. Amer.* from *Die Umschau.* 1500 words in *Scientific American,* May 22, '15. Photos. and diagrs.]

In war, direct measurement is generally impossible; triangulation can be used only in fortifications; and, until recently, guessing was the only method employed in the field.

The stereoscopic or binocular effect of an object at 1500 feet distance, included in a visual angle of 30 seconds, is distinguishable by a good eye; and this distance, which may be called the "stereoscopic depth," can be increased by a binocular glass, or by artificially increasing the interocular distance an instrument of great value is obtained. This is realized in the Zeiss relief telescope and the Zeiss prismatic field glass.

(For details, see article in *Scientific American.*)

RAPID FIRE GUNS

See also

MACHINE GUNS

RATIONS

See

SUBSISTENCE

REAR GUARD

See also

ADVANCE GUARD

RECOIL DEVICES (Artillery)

See subhead RECOIL DEVICES *under various types of* ARTILLERY

RECONNAISSANCE

See

CAVALRY—SCOUTING

COAST DEFENSE—INFORMATION SERVICE

SECURITY AND INFORMATION

RECRUITING

See also

GREAT BRITAIN—ARMY—ORGANIZATION

NATIONAL GUARD—(U. S.)

—Examination and Standards

See

HEIGHT LIMIT

—Methods of

[Army Recruiting Methods. Quoted from *St. Louis Times,* July 2, '15. *Infantry Jour.,* Sept-Oct, '15. 750 words.]

This editorial calls attention to the recruiting posters used by the U. S. Army Recruiting Service, and condemns them on the ground that appeal is made purely as a business proposition after the fashion of employment bureau methods. The opinion is expressed that the appeal should not rest on "inducements" that are interpreted by many as misrepresentations, but should rest on the ground of patriotism, of the country's need of men, and of the necessity of reasonable preparedness.

—Questions of National Efficiency

[Recruiting and Organization for War. By L. G. Chiozza Money. *Fortnightly Review,* May, '15. 3600 words.]

The progress in recruiting for the British army is not accurately known. Statements have been made at various times and places to the effect that recruiting is proceeding along satisfactory lines; that men are coming as fast as they can be dealt with; and that the supply of recruits exceeds the supply of arms. On the other hand, the Prime Minister said in the House of Commons, Mar 1: "The call (for men) was never more urgent or more imperious than to-day." The methods resorted to to secure recruits, including appeals to the women to send the men, indicate that recruiting is not altogether satisfactory.

Recruiting is in its broader sense an organization of the resources of the country for war, and must not only secure men to serve with the colors, but must conserve the productive powers to insure the supply of the armed forces with the munitions of war. Recruiting amongst those engaged in transport (railroad) yielded 72,000 men, but this is a serious crippling of an important service, and it is likewise with the coal miners, dock laborers, shipbuilders, and other classes of labor.

It thus appears that men may be withdrawn from the trades to such an extent as to affect economic conditions very seriously. Men whose productive labor is of vital importance have been taken, while others whose labor is of different character remain unrecruited; married men are being taken, while an enormous number of unmarried men are still available.

The Government has taken cognizance of the importance of the economic issue. Thus a committee was appointed to inquire into the conditions of coal mining, in order to secure the maximum number of recruits with the minimum interference with production.

To obtain a maximum of military and economic strength, promiscuous recruiting must be stopped, and those taken who can be utilized for military purposes with the least loss of economic strength.

What of the objections to compulsion? However true in normal circumstance, they have no relevance in the exigencies of the present hour. The need is for men, and they must be procured in such manner as to make the best use of every man in the country. A survey of the situation shows that it ought to be possible to secure recruits without materially impairing the most valuable labor force of the nation.

On Mar 9, the Government gave further evidence of realization of the problem. The Defence of the Realm Act was introduced. Simultaneously the Local Government Board, in view of the necessity for increasing both the army and the labor force for making munitions, advised the local authorities "that only men indispensable for the work of the authorities should be refused permission to enlist, and

that artisans capable of working in the armament trades should be released and encouraged to find employment in such trades."

RED CROSS

India

[The Indian Saint John Ambulance and the European War. By Maj. R. J. Blackham, C.I.E., V.H.S. *Military Surgeon.* Jan 1915. 1400 words.]

This is the only Red Cross society in India. It began promptly the collection and forwarding of supplies for the care of the wounded, with a depot at Bombay. By October 9, this depot had prepared over 500 ten-bed units of hospital equipment. Necessary provision is being made for replacements.

All over India voluntary aid detachments have been formed. The Ladies' Committee collects gifts for the sick and wounded. Red Cross bags, containing necessary articles for invalided British and Indian soldiers leaving the hospitals, are being prepared.

Thus the Saint John Ambulance provides for the equipment of hospitals, hospital ships, hospital trains, and rest stations, the maintenance of this equipment. and also collects and forwards necessary supplies and comforts for the sick and wounded.

REINFORCEMENTS

See also

ATTACK—USE OF REINFORCEMENTS IN

REPRISALS

See also

EUROPEAN WAR—REPORTS OF ATROCITIES

RESERVE

United States

See

UNITED STATES—ARMY—RESERVE

—Militia

United States

See

NATIONAL GUARD (U. S.)—RESERVE

RESIGNATION (of Army Officers)

See also

UNITED STATES — ARMY — RESIGNATION FROM

RESPIRATORS

[Respirators. The War in Europe. *Army & Navy Jour.* May 22, 1915.]

500,000 respirators to protect British soldiers against asphyxiating gases have been manufactured. 300,000 have been ordered for the Belgian army.

[Respirators. *Weekly Edition London Times,* June 4, '15. 50 words.]

The War Office Secretary announced that an improved type of respirator has been adopted on the recommendation of a special expert committee; that ample supplies of these respirators were then available at the front; and that it was undesirable and unnecessary for the public to send other patterns to soldier friends.

[Protection Against Asphyxiating Gases, England. *Revista de Artilharia,* July, '15. 160 words.]

Early in the beginning of the year the Germans employed asphyxiating gases in great quantities against the allied troops in the vicinity of Ypres. This naturally gave them material advantages. The British Government hastened to issue respirators to its troops. The other allied nations soon followed suit.

The respirator which gives the best results is like a pillow made of woven transparent material, whose interior layers contain a composition, which, when it comes in contact with the humidity of the breath, liberates ammonia in sufficient quantities to neutralize the action of the asphyxiating gases. The pillow is made to fit over the head so that the inside entirely covers the mouth and nose.

[The Best Defence Against Chlorine. *Scientific American,* Nov. 27, '15. 150 words.]

The use of chlorine and bromine gases by the Germans has forced the Allies to use respirators. The ordinary "hypo" of the photographer (=sodium thio-sulphate) is excellent for the neutralization of these gases, but its reaction liberates some sulphuric and hydrochloric acid. Sodium carbonate can be used to neutralize these acids. Self has found the correct formula to be:

	PARTS
Crystallized sodium carbonate (decahydrate)	60
Crystallized "hypo" (pentahydrate)	52
Water	100

The addition of plenty of glycerol prevents drying.

See also

ASPHYXIATING GASES

REVOLVER

See

PISTOL

RIFLE

See

INFANTRY—ARMS—RIFLE

RIFLE SHOOTING

See

INFANTRY—FIRE

RIVER CROSSINGS

—In European War

[Fighting Along the River Line in East Galicia. *The Sphere,* July 10, '15. 300 words. Illustrated.]

Most of the fighting at river crossings has occurred near villages, because they mark the roads leading to the river, and because the villages offer some shelter, or at least screen from view. The German troops have shown great skill both in forcing crossings and in defending them. They always examine very carefully the topography of the river bends where they expect to cross or which they wish to defend. They invariably send advance troops to hold probable points of enemy crossing. Trenches are arranged to give the strongest possible fire on the probable point of crossing. A trench with overhead cover is illustrated.

ROBERTS, Field Marshal, Earl

[Field Marshal Earl Roberts; Memoir. *Jour. Royal Artillery,* Apr, '15. 6000 words. Portrait.]

The death of Field Marshal Earl Roberts removes from the Royal Artillery their most distinguished officer.

Frederick Sleigh Roberts was born on Sep 30, 1832, at Cawnpore, India, where his father, afterwards Gen. Sir Abraham Roberts, was serving. He was educated in England including a year at Eton.

He attended Sandhurst and afterwards Addiscombe, the military college of the East India Company, and was commissioned 2nd Lieutenant, Bengal Artillery, on Dec 12, 1851, joining in India on Apr 1, 1852. His first assignment was to No. 2 Company, 2nd Bn. Bengal Artillery stationed at Peshawar, where his father was commanding the division. This service with his father was of immense value, as General Roberts had been fifty years in India, was intimately acquainted with Indian affairs, and the son thus was brought into personal acquaintance with leading officers on the frontier.

In November 1854, Lieutenant Roberts was transferred to the 1st Troop, 2nd Brigade Bengal Horse Artillery, and in 1856 was appointed D. A. Q. M. G. at Peshawar.

In May 1857, upon the outbreak of the Sepoy Mutiny, he was appointed D. A. Q. M. G. to a movable column formed to disarm the native troops in the Junjab. Later he took part in the siege of Delhi where he did duty with the siege batteries as well as staff duty as D. A. Q. M. G. with the artillery. After the fall of Delhi he served as D. A. Q. M. G. with several expeditions ending with the siege of Lucknow in March, 1858. At Khudaganj, on Jan 2, 1858, he won his V. C.

After his return to India in July 1859, from a year's sick leave in England, he served as D. A. Q. M. G. of the Viceroy's Camp and at Army Headquarters, being permanently posted to the Q. M. G.'s Dept. in April 1860.

He was promoted lieutenant a few days after the outbreak of the Mutiny, 2nd captain on Nov 12, 1860, and brevet major the next day.

He saw field service with the expeditions to the Swat Valley (1863), and to Abyssinia (1868). For his services in Abyssinia Major Roberts was promoted to brevet lieutenant colonel.

On Jan 31, 1875, Colonel Roberts was appointed Q. M. G. of the Bengal Army with temporary rank of major general.

During the wars in Afghanistan (1878-80), he served with great distinction in command of troops, ending with the expedition for the relief of Kandahar in August, 1880. For his services in Afghanistan he was promoted major general Dec 31, 1880, and created a baronet.

After the close of the Afghanistan Wars, General Roberts returned to England but soon was sent to South Africa in consequence of the Majuba disaster.

In Nov, 1881, he was appointed commander-in-chief of Madras, and in Nov, 1885, commander-in-chief in India. This office he held until April 1893 and did much to increase the efficiency and contentment of the troops and improve the defenses of the frontier. On Jan 1, 1892, he was created Baron Roberts of Kandahar and Waterford.

Lord Roberts was made a field marshal on May 25, 1895, and on Oct 1, 1895, commander-in-chief in Ireland. He commanded in South Africa during the 2nd Boer War and for his services there was given the order of the Garter and an earldom. In 1901 he was appointed commander-in-chief to succeed Lord Wolseley and retired in Feb, 1904, when, upon the creation of the Army Council, the office of Commander-in-chief was abolished.

He died in France on Nov 14, 1914, whither he went in order to see the Indian troops serving with the British forces in Europe.

ROCKETS

—Parachute

[Rockets and Searchlights. *Professional Memoirs,* July-Aug '15. Tr. from *Kriegstechnische Zeitschrift,* Jahrgang XVI. Nov. 5, '13. 2400 words. 6 figs.]

To take the place of the searchlight for small military units, a satisfactory substitute has been found in the military parachute rocket manufactured by Aloys Muller & Sons at Constance (Baden). With the increased importance of night operations, the development of a new military means of lighting that can serve both for signaling and illumination is desirable. The searchlight has as disadvantages to contend with, the difficulty of transportation to the front, the impracticability of operating in wooded country, and the confusion often caused by reflected rays from obstacles in the horizontal beams.

The military parachute rocket, developed from the ordinary rocket with wooden staff, is fired from a pistol or rifle. It burns for about 40 seconds with a quite remarkable illuminating power, throwing a cone of rays downward over a zone some 550 yards wide. For illuminating the light is white; for signaling this can be varied by green, red, blue, etc., in any combination. In flat country the signal is visible up to 31 miles. The rocket weighs only about one-third of a pound, the rifle and pistol for firing it 5.5 and 3.3 pounds respectively.

This firm also manufactures an effective flare with metal reflector, a shrapnel rocket, bombs for artillery fire, etc. The introduction of these inventions is claimed to make possible the illumination of troops from aircraft at any height, and to open up other possibilities of technical development.

The figures show the illumination of a landscape by rocket and flare, the auxiliary use of a balloon or aeroplane from which the light is suspended, and the use of simultaneously discharged rockets to illuminate an artillery target.

ROME

—Army

[Military Administration of the Roman Le-

gions. By Capt. Calvani Nicola. *Riv. Mil. Italiana*, Apr., '15. 9000 words.]

The Roman legion was the formidable instrument with which Rome imposed her power upon her surrounding enemies and extended her laws, customs, and commerce to the confines of the known world. It was the tactical and strategical unit of all arms then in use, heavy infantry, light infantry, cavalry, and the rude enginery of war. Its strength at first was 3000 men, but this varied at different times from 1500 to 7000, being usually from 4200 to 6000 infantry and 300 cavalry. In the early days of Rome the legislative power was divided between the senate and the people. With the coming of the empire the power of the people was absorbed by the emperor, and the senate also lost much of its importance. The provinces were under the control of governors, assisted by questors, who handled the funds and exacted tribute from the subject peoples. The supreme command of the army rested with the emperor; each governor commanded the forces in his province, and the questors had charge of matters of administration and supply. They furnished the soldiers with food, arms, clothing, shelter; fixed the pay; distributed the spoils according to rank; and regulated the compensation at termination of service.

The early Romans were a frugal and sober people, living on the simple products of the soil. The most important article of food of the legionary was grain—wheat or barley—ground in a small mill, and boiled into a gruel. This was supplemented by such vegetables as were at hand and by salt pork. Bread was unknown. Roasted fresh meat and fowl were used when they could be obtained. The ration of grain was about a quart per day for an infantryman, and the same for a cavalryman, with about 5 lbs. of barley per day for the horse. Rations were usually distributed monthly, but sometimes every 15 days. Each man prepared his own food.

In the time of the kings, the Roman wars were short and the soldier received no pay, nor was any provision made for his family. As the territory extended, the periods of service became longer and it became necessary to provide for the families or pay the soldiers. The rate of pay first established was about 5 cts. per day. Larger pay was given to persons of rank and to soldiers who had distinguished themselves in battle. Julius Cæsar increased the pay to about 15 cts. per day. The soldier could deposit his savings with the questor.

The clothing of the soldier consisted of two heavy woolen garments: the tunic, worn next to the skin and reaching to the knees, and the field cloak, having many folds and descending below the knees. The latter was the distinctively military garment, worn by all grades from the general to the private soldier. The shoe consisted of a heavy sole, studded with nails to give a good foothold, and an upper, sewed to the sole and held at the ankle with thongs. In rainy and cold weather the soldier wore a woolen cape with a peaked hood. The different bodies of troops were distinguished by differences in the collar, belt, shield, and breastplate.

Spoils of war formed an important feature of the life of the legionary. All booty was turned over to the questor, who divided it into four parts, for the combatants, the reserve, the guard, and the sick. If spoils did not admit of actual division they were sold and the proceeds divided. Each man's share depended on his rank. Captives were sold or assigned to owners. After some of Cæsar's campaigns, the share of each soldier amounted to $800.

Arms for offense and defense were furnished by the state. The former were the pike, the spear, and the sword. The spear was about 4 ft. long, with a sharp iron head, and was a formidable weapon in the hands of a vigorous thrower. The sword used was two-edged, sharp-pointed, and about 32 in. long. It hung on the right side from a shoulder-belt. For defense, the soldier wore the iron helmet, the cuirass, and the shield. On the march, the helmet was slung over the right shoulder, and a woolen cap was worn. The cuirass was made of 5 to 7 iron plates fastened to strips of leather. The shield was sometimes round and sometimes rectangular, and was made of metal or of wood and leather. In addition to his arms, each man carried on the march his rations for 15 days, cooking utensils, 2 stakes for revetment, a change of clothing, a sand-bag, and some rope. It is estimated that the entire outfit of a man weighed about 115 lbs.

The Roman soldier, hardy and frugal, was immune from many of the diseases of the present day. In the early centuries of the republic, the sick were treated by slaves and freedmen, with simple household remedies. The wounded were carried from the battlefield by bearers designated for that duty and were treated by surgeons. They were kept in camp or in the nearest city until their recovery. Invalid veterans were cared for by the state in special buildings in different parts of the empire.

The Roman dominions were connected by great military roads, on which the legions could move rapidly from point to point. In a forced march under the consul Caius Claudius Nero, the troops made 40 miles per day for several days. The impedimenta were transported on beasts of burden driven by slaves. In the time of the empire vehicles with 2 and 4 wheels were introduced. For campaigns in distant lands, fortifications were established with stores of grain, forage and wood. The special services in conection with military operations were performed by noncombatant artificers, such as carpenters, blacksmiths, wheelwrights, shoemakers, tailors, masons, and miners. Sutlers accompanied the army, selling food and drink to the soldiers. Other camp-followers attended with a view to purchasing the hordes of prisoners of war and the spoils put up at auction.

In the second Punic War it became an established custom that the soldier could not be discharged until the close of the war. Af-

ROME—Continued

terward a term of 16 to 20 years was fixed upon as the required period of active service, subsequent to which the soldier was kept on the rolls, but had to respond to call only in emergencies. At the age of 50 he received his final honorable discharge and a pension. He was exempt from taxes and also enjoyed special honors, such as a distinguished place in the amphitheater. Successful officers looked forward to reaping their reward in a brilliant political career after completing their military service.

RUSSIA

—Army—Artillery

See

FIELD ARTILLERY—DRILL REGULATIONS—RUSSIA
FIELD ARTILLERY—MATERIEL—RUSSIA
FIELD ARTILLERY—RUSSIA

—Army—Motor Transport

See

MOTOR TRANSPORT—RUSSIA

—Army—Officers

[Notes of the War. Note. *Army & Navy Jour.*, July 31, '15. 150 words.]

German reports of capture of Russian prisoners reveal a serious shortage of officers in the Russian army. Two reports of captures show 175 officers and 67,000 men, and 101 officers and 29,000 men.

—Army—Sanitary Service

See

BATH TRAINS

—History

See also

EUROPEAN WAR
PLEVNA, BATTLES OF
RUSSO-JAPANESE WAR

—Military Topography of

See also

BZURA RIVER
EUROPEAN WAR—TOPOGRAPHY

—Navy

See

EUROPEAN WAR—NAVAL OPERATIONS

RUSSO-JAPANESE WAR

See

GRENADES—USE OF IN RUSSO-JAPANESE WAR
HSIAO-SI-ERH, ENGAGEMENT AT
PORT ARTHUR, SIEGE OF

SABER

See also

CAVALRY—ARMS—SABER

SALISBURY PLAIN

[Salisbury Plain. By Edgar Louisbury. *Canadian Military Gazette*, May 11, '15. 900 words.]

In the nineties, the British War Office began the purchase of lands north of Salisbury, in Wiltshire. By gradual extension, these purchases have resulted in a camping and training ground 20 to 25 miles square. In 1890, barracks were built at Teaworth sufficient for an infantry and a cavalry brigade, and camping provision was made for other arms. Rifle ranges and an artillery range of ten to twelve miles were added later.

The first great use of Salisbury Plain as a camping ground was made during the Boer War, when militia and volunteers were camped and trained there. In 1902, a test mobilization of 30,000 troops was successfully carried out. This resulted in the provision of additional railroad accommodations.

Salisbury Plain consists mainly of rolling grass land. The soil is shallow and rests on a subsoil of chalk and flint, making trench work difficult. The Avon River flows through the center of the plain from north to south, and affords opportunities for bridge building, as well as an obstacle in maneuvers.

SANITARY SERVICE

[Sanitation in War. Capt. P. J. Marett, R.A.M.C. *Jour. Royal Army Med. Corps*, Apr., '15. 4000 words.]

There is liability to infection from the constant to and fro movement of the men. Segregation is most difficult to use because of military necessity controlling. In the handling of typhoid it is necessary to know by actual examination that there are no carriers among those who handle or cook the food supply; of the breeding of house flies; of the necessity of water to the fly in feeding because the fly vomits this water on the food, and again swallows it and repeats this process until the water is saturated when it passes it to the digestion apparatus. Traps and formalin are used as means of destroying flies. In typhus, there is necessity of inspection for lice and the methods of freeing the body of them are described. In the discussion, it was brought out that the sanitary officer has more control than in the S. African war. An epidemic of typhoid fever has continued until the clothing of the nurses was disinfected, and it then ceased. Training in sanitation had been given to combatant officers, but these trained officers were mostly killed off and it is doubtful if officers untrained in sanitation would, as commanders, continue the work.

[Is the Volunteer Medical Officer of To-day a Soldier? By Maj. G. M. Beech, Med. Corps, Ill. Nat. Guard. *Military Surgeon*, May, '15. 3500 words. Illus.]

There is some justification for the classification of the Regular Army and the Militia as "professional" and "amateur" respectively, but the present-day serious purpose of the National Guard is lessening the distinction between the two. From little more than a social organization, the National Guard service is becoming so stringent in its professional requirements, particularly of the officers, that some qualified and enthusiastic men have had to leave the National Guard because they could not spare the time required for their duties. With the development of the sanitary service, in which Jonathan Letterman was a conspicuous pioneer, the medical corps officers can no longer be regarded as mere doctors in uniform.

The work of the sanitary service, prevention

of epidemic diseases, care and evacuation of wounded and disabled, is both professional and military in character, and does much to maintain the fighting efficiency of troops.

The same serious purpose that is transforming the other arms of the National Guard also affects the sanitary service. Faults there are still, but the guard is imbued with the proper spirit.

As a suggestion to younger officers, the subject of malingering is an important one. The literature on the subject is voluminous in countries under universal service. To physicians in civil practice accustomed to relying upon statements of patients for clinical histories, the problem will be a new and difficult one.

The instruction in first aid and sanitation should be thorough. The wounded should not be exposed to the suffering incident to awkward handling when litter drill will obviate this difficulty. Drills should be properly conducted, and commands properly given. Map reading is easily taught by means of models capable of being separated in horizontal planes of contours, or by means of clay models and liquid.

The labor and irksomeness of instruction in moving and pitching a hospital camp may be almost entirely obviated if a little trouble is taken to make such a move simulate some actual condition of service; so that the men may see some purpose in the work.

Medical officers should be selected by competitive examination. Commissions in the Regular Medical Corps should be given to competent men with enthusiasm and ability. Surgeons general should be responsible for the training of their corps, and should cooperate with the inspectors general in establishing correspondence schools, lecture courses, and week-end practice marches. They require power to enforce reasonable measures for promotion of efficiency.

The government should arrange so that in matters of instruction, economy will not have to be practiced to the detriment of efficiency.

Germany

[German Sanitary Organization. By Major G. M. Blech, Med. Corps, Ill. N. G. *Arms and the Man.* 3300 words.]

In Prussia and Württemberg, the majority of military physicians are graduates of the Kaiser Wilhelm Academy at Berlin, which is a special medical school for training the medical officers of the Army. Candidates for admission must apply to the Surgeon General of the Army six months before graduation from the gymnasium. Training at the Academy lasts four years, including six months as a one-year volunteer, after which students are appointed as active sub-physicians. They then serve one year at the Royal Charité Hospital, Berlin, after which they take the state examination. After several months of troop service as sub-physicians, they are elected to the medical corps and confirmed as assistant physicians. Graduates of the Academy are obliged to serve at least nine years in the army. Graduates of civil universities complete their one-year-volunteer service as so-called one-year-volunteer physicians, and during this time apply for appointment to the regular establishment as "active sub-physicians." Their subsequent career is about the same as that of the graduates of the Academy.

The Sanitary Service of the German Army is conducted by the Sanitary Corps, composed of sanitary and of acting sanitary officers, and of the enlisted personnel. There is no separation between the medical and the hospital corps. Taking the Prussian Army as typical, the head of the service has the rank of lieutenant general, and has under him 5 sanitary inspectors, each presided over by an officer (*obergeneralarzt*) with the assimilated rank of major general. Each of these inspectors covers administratively 3 or 4 army corps, in each of which in turn the sanitary service is assured by a *generalarzt*, with the assimilated rank of colonel. These chiefs of the corps service have charge of the commissioned sanitary personnel, direct the entire sanitary service of their units, conduct the training of the sanitary service in maneuvers, etc. They are assisted by a suitable staff—and maintain besides, stations for chemical and bacteriological work. Sanitary chiefs of divisions have the grade of *generaloberarzt* (lieutenant colonel); their duties correspond to those of corps surgeons. Garrison surgeons have practically full control over all sanitary officers of the garrison. The regimental surgeons have the same functions as in the U. S. Army, but must give in addition professional treatment to the sick of one battalion. Each other battalion (artillery or infantry) has assigned to it a battalion surgeon. The enlisted personnel is recruited from men who have served under arms for one year.

In time of peace, sanitary mobile units, such as ambulance companies and field hospital companies do not exist in Germany. They are hastily organized for maneuver purposes and in case of war.

In battle, the *Truppenverbandplatz* corresponds to our regimental aid station. Each battalion has an infantry sanitary wagon. Half of the sanitary personnel of the regiment remains with the wagons, the other half follows the troops into action in order to give first aid. Each company furnishes two specially qualified men as "auxiliary bearers," whose duty it is to transport the wounded on litters to the aid station. The regimental sanitary personnel consits of 6 or more commissioned officers, 16 sanitary n. c. o. and men, and 48 auxiliary litter bearers. The Cavalry have a special sanitary wagon; the artillery has none, but is supplied with one sanitary chest per battery. Sanitary wagons are not ambulances, but are used to transport medical and surgical supplies.

The Sanitary Company corresponding to the U. S. Ambulance Company, has 13 wagons, whose teams are ridden by supply train men. The company proper has 206 litter bearers who go afoot. The military command lies in the hands of a train or of a line officer. To each company are assigned one chief physician (=major), and 6 assistant (=lieutenants), all mounted, and sent where needed, if the com-

SANITARY SERVICE—Continued

pany is not active. Each company has eight ambulances. The litter bearers march to the regimental aid station, load the ambulances and transport the patients to the *Hauptverbandplatz* or principal dressing station, which has in the mean time been established by the sanitary company. There dressing stations consist of two large tents, one surgical, the other for dressings, whose equipment is carried on two sanitary wagons. The chief physician of the company is in charge, under the supervision of the division surgeon. Of these sanitary companies each corps has three, besides twelve field hospitals, capacity 200 beds each; each unit carries disinfecting appliances.

Evacuation of the sick and wounded is accomplished by special hospital trains, by rail and water transportation generally specially equipped for the purpose. Rest stations are organized at each important railway point, the home garrison hospital and the ultimate stations of evacuation corresponding to our general hospitals. Base hospitals do not exist: but there are base supply depots.

See also

AERONAUTICS—MANUFACTURE OF AEROPLANES—DANGERS IN
BATH TRAINS
DISEASES
EUROPEAN WAR—DISEASES IN
HOSPITALS
SURGERY, MILITARY
VERMIN EXTERMINATION
See, for the work of the SANITARY SERVICE *in specific Wars, Campaigns, Battles or other military operations, the subhead* SANITARY SERVICE *under such specific heads.*

—In European War

See
EUROPEAN WAR—SANITARY SERVICE IN

—Instruction and Training

[Combining Medical with Military, and Military with Medical Education, and Mingling Music with Both. By Sir Henry Morris, Bart. F.R.C. Surg. *Lancet,* Sept. 18, '15. 2500 words.]

The author finds it convenient to commence his address with the following well known passage after Milton:

"I call therefore a complete and generous education that which fits a man to perform justly and magnanimously all the offices both private and public of Peace and War."

It was Sidney Herbert (Lord Herbert of Lea) Secretary of War at the beginning of the Crimea who did so much to reform medico-military education in the British Army. He quickly seized the idea that it is easier to prevent disease than to cure it, and he proclaimed that the principal duty of the doctor is to keep soldiers in health. The problem of utilizing medical knowledge for the benefit of armies has been solved by very slow degrees. In antiquity and in the middle ages medico-military learning was practically unknown. A medico-military system first came to notice at the end of the 19th Century under Larrey and Sir James McGregor in the days of the French Revolution and the Napoleonic wars, but it was practically forgotten at the time of the Crimean war in 1854.

The blunders of the Crimean and Civil wars, and in fact all the wars up to the Boer war, have been potent factors in bringing the system of army hospital administration, dressing stations, field and base-hospitals and the Army Ambulance service to their perfect state of efficiency as witnessed in the present European war.

The author has much of interest to relate about military medicine in the time of the Greeks, and of Milton's scheme of education. Milton was himself a fine swordsman, fully imbued with the value of military education for youths, which is interwoven in his writings with the best rules for keeping the bodily functions in the best of health. His military exercises and his views in relation to present conditions which lend themselves to the value of military education in all schools are interestingly told.

The influence of music in the scheme of education by the ancients and the school-men of the middle ages is touched upon, but some skeptical suggestions are made of the softening influence of music on certain musical nations.

—Military Functions of the

[The Military Functions of an Army Medical Service. By Lt. Col. M. W. Russell, R.A.M.C.D.A.D. of the Medical Services, Eastern Command. *Military Surgeon,* Aug., '15. 5000 words.]

This article is on the military function of the army medical officer, and regards his duty as one of keeping the tools of war, the soldiers, in good physical shape, and salving as many as possible from the wreck of battle; if the medical officer does not "render active medical assistance in deciding the course of a battle or campaign," he has not justified his position and there is no real reason for his being in a military organization. There are two influences of the medical department of an army—the political influence on the nation at large, and the moral influence on the troops engaged in the fighting. The general commanding is directly responsible to the government, the government to public opinion. Disease in the troops causes the general to be investigated and thus distracts his attention from the military problem upon which he is engaged, a separate and distinct proposition from his desire to keep his force in perfect physical condition. Cites instances where the health of the command interfered materially with the progress of the campaign, some in which good care benefited conditions. Mentions some of the losses from disease in war. One of the greatest values to the fighting force is that they evacuate the sick and wounded, take charge of the discipline, pay, clothing and disposal of them from the time they come under medical care until returned to duty. Having assured the commander the maximum number of men, they must free him from the

encumbrance of the noneffectives and dispose of them. Armies have been immobilized, being unable to rid themselves of their ineffectives. Hence the need of well organized relief, ambulance companies, sanitary trains, etc.

—Naval

[Report on the Casualties in Action between the *Pegasus* and the *Königsberg*. By Staff Surgeon A. J. Hewitt, R.N., *Jour. Royal Medical Service,* April, '15. 3000 words.]

The most remarkable feature of the wounds was the large number of very small ones like the pitting of powder burns, and the small penetrating power. The fragments appear to have had a very high initial velocity but lost it very rapidly, entering the tissues from two to four inches. One man had his right arm so badly shattered that it was necessary to amputate, while another fragment of the same shell which struck his belt plate did his abdomen no injury. Some eyes were lost that the author believes a pair of goggles would have saved. He is of the opinion that a light chain armor, or even leather and strong goggles will prove invaluable to captains of destroyers, navigators and others in exposed positions. The fumes from high explosives produce "a sickly stupefying effect." The collecting stations were placed below the water line. Each gun was supplied with dressing, etc., fastened inside of the shields. Each other exposed position had the same bag of dressings, etc. Stretchers were also placed. The *Gascon* was converted into a hospital ship and took the wounded to Simonstown.

———

[North Sea Action of January 24. By Staff Surgeon John R. Muir, R.N., *Jour. of the Royal Naval Medical Service,* Apr., '15. 2700 words.]

Medical arrangements on board the *Tiger*. Forward station almost immediately below the "B" turret; after station almost under the "X" turret. The original intention was to receive each patient, go over him thoroughly, and give the attention needed. It was speedily recognized that the violent concussion from the "B" turret made operative treatment impossible. It was agreed before action that men who could not help themselves must be left in the turrets until after the action, as it would be impossible to handle the litters. First aid was the most that could be done. The sick bay could not be opened up until the ship was out of the danger zone.

—Organization

[A Guide to Facilitate the Organization and Administration of Independent Sanitary Commands in the Field. By Capt. G. P. Peed, Med. Corps, U. S. Army. *Military Surgeon.* Mar. and Apr., 1915. 18,000 words.]

[Realizing that in the event of war sanitary commands must be hastily organized with inexperienced men, the author has gathered together much data that will be invaluable in effecting such organization. No abstract can be given of the contents of this article, which covers a wide range of topics in detail, giving forms of orders and all necessary information.]

United States

[Evolution of the Sanitary Service in the National Guard and Some Defects in Its Administration. By Maj. F. O. Wagge, Med. Corps, Penn. National Guard. *Military Surgeon.* Jan, 1915. 3400 words.]

The development of the sanitary service of the National Guard has been affected by the increasing knowledge of sanitation and hygiene, by the lessons of the Spanish-American War, by the example and instruction of the Regular Army sanitary service, by the realization that the National Guard is part of the national defense, in which physical efficiency is highly important and can be maintained only by proper sanitation and hygiene, and by the realization of the necessity of coordination with the regular army.

Progress has been slow, because uniformity, sanitary discipline, and control in sanitary matters by medical officers require consent and approval from many sources, and frequently have to be gained against an established regime.

By the co-operation of the War Department, the Surgeons-Generals and Adjutants-General of the states, much can be done to co-ordinate the National Guard sanitary service with that of the regular army. Many of the Medical Department forms of papers should be used. Surgeons should be consulted as to camp sites and other sanitary arrangements. Each brigade or division should have a sanitary inspector with power and responsibility. More field instruction should be given the sanitary troops in summer camps. In the joint maneuver camps, the regular medical officers should arrange more frequently for combined sanitary instruction rather than inspections. Many of these improvements could be made without any general upheaval.

—Transportation of sick and wounded

[Italy at War. Editorial. *Lancet* (London), Sept. 25, '15. 1000 words.]

Railway service transporting wounded and prisoners from the front throws much extra work on the station men, in cleansing the station itself, the lavatories, tracks, etc. The tracks are disinfected with chloride of lime whenever a hospital or prison train stops for any length of time at the station. Travel in Italy is particularly safe for this reason.

See

AMBULANCE COMPANIES
DOGS—SANITARY SERVICE
STRETCHERS

—Transportation of Sick and Wounded—Hospital Trains

[Railway Hospital Trains. By Captain H. Scheen, Sanitary Service. *Norsk Militaert Tidsskrift,* May, '15. 3000 words.]

Among the innumerable problems of the railway companies in a country at war, one of the most important is to provide for the sanitary service a sufficient number of railway hospital trains. At the outbreak of the present war, England directed the great railroad companies to provide a number of trains specially fitted to carry sick and wounded. These trains are made up of 9 coaches, 5 of

SANITARY SERVICE—Continued

which are for the sick with 20 comfortable beds in each one. The personnel has a separate coach with berths, dining room and day room. Besides, the train has an operating and dispensary coach and a kitchen car. The floor of the operating car has a thin covering of lead, with a drain in the center. To facilitate cleaning, the floor is rounded at the walls to a height of 3 feet and overlaid with aluminum. The car is well lighted, and has closets for all articles for a modern operating room.

All cars are fitted with torpedo ventilators. All floors are covered with thick linoleum. The cars bear the Geneva cross on sides and roofs on account of danger from aerial attacks. All the English trains have their headquarters at Southampton, from whence they distribute the sick over England.

The railway hospital train "de luxe" in Europe is the "Bayerische Lazarethzug nr. 2"—a train which is very nearly ideal.

The Bavarian army equipped 14 hospital trains at the outbreak of the war. The 15th, presented by the museum "Meisterwerke der Naturwissenchaften und Technik," is called No. 2. It is designed like all German trains to carry 200 sick and wounded, and consists of 29 coaches, *i. e.,* 14 cars each with 14 beds, 1 car for wounded officers with 7 beds, 1 operating and X-ray car, 1 disinfecting car, 1 car for the lighting plant, 2 cars for surgeons, nurses and clergy, 2 cars for the sanitary personnel, 1 office car, 1 kitchen car, 1 provision car, 1 storeroom car and 3 baggage cars.

1. *Car for enlisted sick.*—Has 14 beds, 2.10 m. long by 0.80 m. wide, along both walls, with center aisles, beds in form of litters. The upper berth in connection with the lower forms a sofa, or can be entirely removed for seriously wounded. There are reading lamps at all beds. Each car has water closet, wash bowl, and a roomy clothes closet. The mattresses are divided into five separate pieces.

2. *Officers' car.*—Has 7 single bedsteads of white-enameled iron, equipped with special springs. Light wounded can use the bed as a sofa during the day. Otherwise the car is equipped like the enlisted men's car.

3. *Operating and X-ray car.*—Divided into 5 parts. The operating room is in the center, fully equipped. Directly over the operating table is a strong electric light with a mirror reflector. All lights are so arranged that no shadows are cast. Next to the operating room is the sterilization room, fully equipped. All metals with which the surgeon or the patient may come in contact are nickeled. Next to the sterilization room is the dispensary. The X-ray apparatus has a separate room. Walls and ceiling are white enameled.

4. *Disinfecting car.*—This car is equipped with ovens, steam and formaldehyde apparatus, and a shower bath for surgeons and attendants.

5. *Lighting plant.*—This car, besides a reserve of gas under pressure, furnishes electricity for 330 lamps, and has also a boiler which furnishes hot air for the operating room.

6. *The cars for surgeons, nurses, and clergy* are divided into 9 single rooms, each with sleeping couch, clothes closet, desk, washbowl, etc., etc.

7. *The cars for the sanitary personnel* are equipped as the car for sick and wounded, except each has 10 beds, a dining room, table, chairs, etc.

8. *The office car* is equipped with desks, book cases, 2 typewriters, filing cabinets, etc.

9. *The kitchen car* is equipped to cook for 300 persons. The food is carried to the sick in containers which keep it piping hot. The train is provided with a telephone system, connecting all cars.

SANITATION

See

Sanitary service

SARDINIA

See

Horses—Breeding of—Sardinia

SCHOOLS, Military

See also

Fort Riley Mounted Service School

Spain

[Military Schools in Spain. Anonymous. *Rev. Militar* (Argentine), June, '15. 2500 words.]

Superior School of War.

(Gives program of studies for each year of the three-year course.)

Central School of Fire.

This school is located at Carabanchel. It is well equipped with pieces of different caliber and necessary apparatus for instruction in field firing, and possesses a field of fire 8 km. in extent, with a number of small fortified works.

An experimental commission is located at the school to study and test new ideas or new matériel.

School of Aviation.

Has about 40 student officers of the several arms under instruction this year, and is well provided with monoplanes and bi-planes of different types.

Instruction is given in aeronautics, dealing with balloons, kites, dirigibles, and aviation, including all means of aerial locomotion by heavier-than-air machines. These two branches are entirely distinct, and each has its own navigating personnel, troops, matériel, and schools.

The student officers are trained for the duties of pilots and observers, and selected non-commissioned officers and privates for the positions of pilots and mechanicians. Instruction is mainly practical, and candidates for the positions of pilots and observers are subjected to a thorough examination, which includes many practical flight tests. Successful candidates are graded as pilots of the 1st or 2d class, according to ability.

The scope of the examination and the number and nature of the practical tests are given

in detail; also the compensation to aviators of different grades.

School of Equitation.

Continues the instruction and training of officers of cavalry and field artillery. The system of instruction follows in some respects the Italian School of Equitation. The school maintains a good riding hall, and a part of the class has daily exercises in the open. A certain number of colts are broken and trained each year, the best being retained at the school for special development. To stimulate the zeal of mounted officers, a tournament is held annually in the hippodrome at Madrid.

SCHWARZLOSE MACHINE GUN

[Tests of the Schwarzlose Machine Gun, *Boletin del Ministerio de Guerra y Marina,* Lima, Peru. Reprinted in *Memorial del Estado Mayor del Ejército de Colombia,* Apr, '15. 1300 words.]

In the Schwarzlose Factory on the River Steyr in Austria are made our Mannlicher rifles, model 1888 (Peruvian Army).

The machine-gun made at the same place has the following characteristics:

1. The barrel is fixed; hence there is no heat generated by its movement during the firing.
2. The mechanism has few pieces (six).
3. The gun functions with blanks as well as ball cartridges.
4. It has a special tube to prevent the water vapor generated in the water-cooling apparatus from being seen.
5. It is light and easily transported.

Tests

Precision: 100 cartridges were fired at 100 meters distance; the resulting pattern was 12 by 19 centimeters.

Velocity: Three bands of 250 cartridges were fired in 1 minute, 40 seconds.

Length of time the same water may be used: The water boiled after the firing of 850 cartridges. Then the machine-gun will continue firing until 2000 cartridges have been fired in all.

We believe that the Peruvian government should study the subject of machine-guns, testing these four types: 1. Schwarzlose. 2. Hotchkiss. 3. Maxim. Model 1909. 4. Skoda.

(The author admits that the Hotchkiss has many good points, but favors the Schwarzlose.)

SCOUTING

See
Reconnaissance

SEARCHLIGHTS

[Editorial note. *Army & Navy Jour.,* Nov. 13, '15. 150 words.]

Two new searchlights are nearing completion at Washington Barracks, and will soon be tested at Fort Sill and later on the border. One is a 30-inch reflector for observation and for direction of artillery fire. The searchlight will be on a trailer. The engine of the tractor will also run the dynamo when the searchlight is in use. The smaller light will derive power from storage batteries charged by a "mother" tractor.

—Control of

[Distant Electrical Control of Search-Lights, Guns, etc. By W. Wolf. *Kriegstechnische Zeitschrift,* Jan-Feb, '15. 2700 words. 7 drawings.]

A technical discussion of distant control of search lights, guns, etc.

SECURITY AND INFORMATION

See also
Advance guard
Cavalry—Scouting
Coast defense—Security and information service
Reconnaissance
Surprise
Signalling

SERBIA

[Serbia. *Información Militar del Extranjero,* Madrid. May, '15. 4000 words.]

(A short account of the origin and distribution of the Serbian people, the extent of the present political limits, the organization of the government, commercial development, and military resources.)

—History

See
Balkan wars
European war
Typhus—In Serbia

SERVICE REGULATIONS

See subhead Service regulations *under subhead* Army *under names of specific countries.*
Also under Cavalry, Infantry, *etc.*

"SEVERN"

See
"Königsberg"-"Severn" engagement

SHARPSHOOTING

See
Infantry—Fire—Instruction and training

SHIELDS

See
Bulletproof shields

SHOES

[The Army Shoe. By "Also Interested." *Army & Navy Jour.,* Nov. 6, '15 300 words.]

The shape of our army shoe is excellent, but the soles and uppers are too light. Shoes now being made in this country for the French government are much better than ours. The soles are heavy and hobnailed; there is no canvas lining; and the uppers, dressed smooth on the inside, are soft and pliable. Everybody who has to be on his feet for long hours or to walk much wears heavy shoes. We should learn from this fact.

SHRAPNEL

[Defective Shrapnel. Contemporaneous Notes on the European War. Editorial. *Artill. Monatshefte,* Mar, '15. 5000 words.]

Many persons returning from the front report having seen a great number of shrapnel

SHRAPNEL—Continued

cases that did not splinter and they conclude that this ammunition must be defective. Such is, however, not the case. The fact that the shrapnel case does or does not splinter is a desideratum fixed by the ballistic properties of the gun and the size of the angle of opening. Some guns give a high initial velocity and develop a high powder pressure, for which reason the case must be made sufficiently strong. Other things being equal, a shrapnel case which does not splinter will produce a smaller angle of opening and give a greater increase in velocity to the shrapnel contents. In the manufacture of shrapnel the specifications fix the least or the greatest number of cases which may splinter, depending upon whether it is desired to have a case which will remain whole or which will splinter at the moment of burst. The Germans call these unexploded cases *Ausbläser*. The French have given them the name *Marmite*, meaning a camp kettle.

See also
EUROPEAN WAR — AMMUNITION — SHELL PREFERRED TO SHRAPNEL

—Cartridge Cases

[Cartridge Cases for Field Gun Ammunition. By Douglas T. Hamilton. *Scientific American*, July 10. '15. 600 words. Diags.]

The material used is usually a composition of two parts copper and one part zinc for shrapnel cases, and the case is drawn from a single sheet; the number of operations varying with the methods of handling. As the drawing operations increase the hardness, the ductility is restored by annealing, in most cases at a temperature of from 1150 to 1200 degrees Fahr.

The diagrams show the various stages of the processes.

The hardness must be up to a certain standard, since, if too soft, the case takes a permanent set from firing and is liable to stick in the gun; or, if too hard, the head may blow off.

The final operations call for considerable accuracy, and the machines and methods employed require the best mechanical skill.

—Fuze—Correctors

[The Design of Fuze Correctors. By Capt. H. J. Jones (I.O.M), A.O.D. *Jour. of the Royal Artillery*. Jan., 1915. 2800 words, 3 tables.]

Many considerations are involved in determining the point of most effective burst of shrapnel, and that point varies with the nature of the gun. Giving due weight to all these considerations, it is assumed that against personnel the point of most effective burst is that giving a bullet density not greater than one per square yard. Upon this assumption, the time of flight to point of burst is an increasing function of the range. External ballistic tables are based upon accurate knowledge, and the time of flight to any point of the trajectory can be accurately calculated. But the fuze setting for a given time of flight is based upon data much less general and reliable, and the effect of abnormal conditions of temperature, age, and humidity is little known. The influence of temperature on the trajectory is known, and this in itself would require corrections in the fuze setting.

For standard conditions, the fuze correction for different ranges is neither constant nor proportional to the range. A change of .1 in the fuze setting makes diminishing changes in range to burst as the range increases.

The function of a fuze corrector is to enable the data as to fuze correction ascertained by firing at one range to be used to determine the fuze correction at other ranges.

Fuze correctors generally have parallel range and fuze scales so arranged that by relative movement adjusted to ascertained correction at one range, the correction for all other ranges will be indicated. They are of three classes: (a) those giving a constant alteration of elevation of burst at all ranges; (b) those altering the distance short to burst in direct proportion to the range; and (c) those making a correction directly proportional to the fuze setting, *i. e.*, range to burst.

The correction in the first class is decreasing for increasing ranges, whereas it should be increasing; the second has range scales graduated to represent the differences of the logarithms of the ranges; in the third, a logarithmic scale represents the fuze setting. A comparison by calculation shows the correction derived from the third type to be more nearly the true value.

The logarithmic correctors have a number of defects, most of them following from the subdivision of varying intervals. These difficulties are aggravated for the howitzer and for slow-burning fuzes.

By calculated values for various ranges, it appears that even unit alterations in logarithmic correctors are necessary for effective work against personnel offering a target of little depth. This fact, combined with the inherent defects of these scales, explains the lack of effect of shrapnel at the longer ranges under difficult conditions.

Based upon simple trigonometric functions of the fuze instead of the logarithmic function, a corrector has been designed that gives within five yards of the theoretical correction over the whole range scale and permits the use of an automatic fuze setter.

——Timing of

[High Bursts. Editorial. *Artill. Monatshefte*. Jan 1915.]

It is reported that the French burst their shrapnel too high to produce much effect. It is impossible for any one who is not at the firing point to judge this matter. Height of burst varies with the range. The error of the gun is likely to cause high bursts, as are also unavoidable errors made during adjustment. In observing, the mistake is generally made of judging bursts too high. A false height of burst may also result when firing at a target which is much lower than the crest which covers it. For howitzers bursts can seldom be too high. Aero observers can give little assistance in observing heights of burst.

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[The Percentage of Bursts on Graze. By

F. Grund. *Mem. de Artill.* (Spain), Apr, '15. 2500 words. 3 figures.]

Recent tables of fire published by the 1st Section of the Central School of Fire contain new data, amongst which are the vertical 50% zones. Knowing these values, in order to determine the per cent of bursts on graze corresponding to a given altitude of the centre of burst, it is sufficient to divide the given altitude expressed in meters by half the value of the said zone, take from a "table of probability factors," the per cent corresponding to the quotient thus obtained, and subtract half this percentage from 50.

When the vertical 50 per cent zone is not given, the probable percentage of bursts on graze may be obtained from the formula.

$$50-\tfrac{1}{2}t\left(\frac{H}{\tan\omega\sqrt{(\delta_t\cos\omega)^2\times\delta_l^{\,2}}}\right)$$

in which H is the height of the center of burst, δ_t the width of the tangential 50% zone of bursts, δ_l the longitudinal 50% zone of impacts, ω the angle of fall and t the factor of probability corresponding to the number given by the expression in parenthesis.

[Type Height of Burst for the 7.5 cm. Krupp Rapid Fire Mountain Gun, Model 1908. By the 1st section of the Central School of Fire of the Army. *Mem. de Artill.* (Spain). Apr., May, and June, '15. 25,000 words, 30 figures, 20 tables.]

When a shrapnel bursts at any point of its trajectory, the resulting motion of the balls is principally influenced by:

(a) The velocity of translation or remaining velocity possessed by the shrapnel when the explosion takes place.

(b) The increase in velocity of translation due to the explosive charge.

(c) The radial velocity or velocity normal to the axis also due to the explosive charge.

(d) The tangential velocity due to the rotation of the projectile and perpendicular to a radius of the same.

In each burst the first three are common to all the balls but the last is not. The tangential velocities increase with the distance of the balls from the axis of the projectile.

Consequently the balls directly in contact with the envelope will be those which separate most and, because of the symmetry in the construction of the shrapnel, these balls will form the outside of a right cone the axis of which will coincide with the prolongation of the trajectory and the vertex of which will be at the point of burst.

Knowing the values of the component velocities enumerated above, it is easy to evaluate the resultants corresponding to the extreme balls and, therefore, the angle of the cone of dispersion.

The increase in velocity of translation is determined practically by firing the shrapnel at rest and determining the velocity of the balls by means of a chronometer.

The radial velocity is measured by firing the shrapnel at rest to obtain a pattern on a screen, the diameter of the pattern in connection with the distance of the screen, and the previously determined velocity of translation, permits the computation of the radial velocity.

The tangential velocity is equal to the product of the muzzle velocity by the tangent of the angular twist of the rifling at the muzzle. As in shrapnel the difference between the radius of the envelope and the distance between balls which are in contact with the envelope and the axis is insignificant, they may be taken as equal without sensible error.

Values thus obtained give for half of the angular opening of the cone when the shrapnel bursts at the muzzle 7° 47′ 26″. Direct experiment with the shrapnel set at zero gives for this angle 7° 45′ 51″. Patterns thus obtained show a blank space in the centre due to the type of shrapnel used.

The angular opening of the cone of dispersion increases with the range.

The balls being scattered in various directions and with distinct trajectories, the energy of impact of each will be different.

It is clear that if this is sufficient to put a man or a horse out of action, the ball is efficient. Although the Germans consider 8 kgm. sufficient against men and 11 to 17 kgm. against horses, the French require at least 12 and 19 kgm. respectively.

Until lately we have taken 8 kgm. as standard. To-day 16 kgm. is generally considered as the inferior limit of energy which a ball should have on impact, the weight of the balls being 0.01 kg., the necessary velocity is 177 m.s.

[The remainder of this article is chiefly concerned with the computation of numerical data for the particular gun in question. After an exhaustive study the conclusion is drawn that 6 mils is the best height of burst to be taken as standard for this gun.]

[Mean Heights of Bursts (continued). *Mem. de Artill.*, Madrid, May, '15. 7200 words. Tables, Mathematical demonstrations.]

Depth of shrapnel beaten zone. The distance between the vertical from the point of burst to the point of impact of the shortest shrapnel ball is found from the formula:

$$OC=\frac{h}{\tan(\omega+a)}$$

in which h is the vertical distance.

ω is the angle of fall.

a is the half angle of opening of sheaf.

The depth of the zone covered by the lower semicone of dispersion, for a constant range, increases as the height of burst, and decreases for a constant height of burst and increasing range.

The depth of the zone covered by the effective portion of the upper semicone of dispersion can be determined by the formula: $BF=OF-I$.

OF is the distance from the intersection with the ground of the vertical from the point

SHRAPNEL—Continued

of burst to the point of impact of the highest effective shrapnel ball.

l is the distance from the same point to the intersection with the ground of the axis of the cone of dispersion.

The maximum depth of the zone that can effectively be covered by shrapnel measures 100 meters.

At 1000 meters for an angle Φ made with the horizontal equal to $4° 55'$, the highest shrapnel ball will strike the ground at a very great distance off; for a range of 2000 m. $\Phi = 15' 30''$, it will cover a horizontal distance of 350 m.; for 3000 m. $\Phi = 6° 10' 30''$, 200 m.; for 3500 m. $\Phi = 10° 8' 3''$, 150 m.

Width of zone covered by shrapnel.

For equal heights of burst, the width decreases with the range. For a constant range, the width is directly proportional to the height of burst.

The preferable height of burst is 6 mils, which permits a battery to cover from 80 to 100 meters front.

Distribution of shrapnel balls.

As a result of many experiments, it has been found that there are 124 out of the total of 262 in each semicone of dispersion, the remainder being lost or falling outside. In the lower semicone all the balls are effective; such is not the case in the upper zone.

As the height of burst increases, the number of effective balls for each range diminishes; and for the same height of burst, the number of effective balls increases as the range.

Real effect does not depend entirely upon the number of balls that strike within a zone of certain dimensions, but also upon their angles of incidence.

—Use of

[The Efficiency of Shrapnel When Used to Search an Area. By Lieut. Gen. H. Rohne, unassigned, German Army. *Artilleristische Monatshefte*, Jan 1915. 7500 words.]

[NOTE.—This is a continuation of former discussions on the efficiency of shrapnel fire by the same author, to wit:—New Study on Shrapnel Fire, *Artilleristische Monatshefte*, Jan, Feb, Mar 11; Efficiency of Shrapnel Fire, idem, Jan 14; The Effect of Shrapnel Fire According to the New Firing Regulations, idem June 14. The studies are all technical and cover the question of shrapnel fire and methods of fire from every point of view. A complete translation is printed under the title "Efficiency of Shrapnel Fire" by the School of Fire for Field Artillery, Ft. Sill, Okla., which is of interest to Field Artillery officers as a book for study.]

In using shrapnel we aim to search and cover a particular area with effective fire. The size of the ground pattern does not give a true representation, for a large part of this area is not effectively covered. Therefore it is best to measure this efficiency by determining the danger space covered by each effective bullet, and then taking their sum. In doing so two assumptions are made which are not exactly true; (a) the trajectory of each bullet from the point of burst is a straight line; (b) the distribution of the bullets within the cone is uniform. The resulting error is however very small.

The Firing Regulations prescribe a 3 mil height of burst, but unavoidable causes produce a probable error of 1½ mils. The discussion will therefore consider heights of burst of 1½, 3 and 4½ mils at ranges of 2000 and 4000 meters taking the German light field gun '96, the German light field howitzer, and the French 75 mm. gun.

The method is as follows: A right section of the cone of dispersion is made and the resulting circle is divided into 40 zones by chords drawn parallel to the ground at a uniform interval. 15% of the bullets are eliminated as being outside the cone of dispersion and the remaining 85% are distributed uniformly within the circle. The number of bullets in each zone is therefore directly proportional to the area of the zone. The mean angle of fall of the bullets of each zone is then determined. From this the danger space of each bullet is determined, using the area of a standing skirmish figure as a basis. The sum of these danger spaces gives the total danger area covered by all the shrapnel bullets. But this total area does not represent the true area effectively covered. The total area must be corrected for bullets whose remaining velocity has fallen off so much that the striking energy is insufficient to surely disable a man. At 2000 m. for the German gun, this condition will obtain at 289 m. from the point of burst. On the other hand, the density of bullets in some zones will be so great that any person in this area will be struck by more than one bullet. This condition will exist when the density is in excess of 2. After making the necessary corrections outlined above it is found that the net danger area covered by a single shrapnel is greatly reduced. After a tabulation of the different values, the following conclusions must be drawn: (1) A flat trajectory is decidedly superior. (2) In most cases a large angle of opening is superior to a small angle of opening. (3) The greater the angle of fall, the greater must also be the height of burst—not only absolutely but also in its relation to the range. (4) If a flat trajectory is combined with a large angle of opening, a great part of the effect is lost because so many bullets are projected upward and do not have sufficient striking energy upon impact. (5) With a small angle of opening, the efficiency of the shrapnel is impaired by the excessive density of hits. (6) For light guns a 3 mil height of burst is best; for howitzers, a burst twice as great is more advantageous. (7) The maximum effect is obtained when the angle of fall and the angle of opening stand in a certain fixed relation to each other.

It is therefore necessary to fix what is considered the principal battle range and from this to determine the best corresponding angle of opening. It probably can be proven mathematically that an angle of opening which causes the uppermost bullet to have just sufficient striking energy is the most favorable for effect. Therefore for the light field gun if we consider 4000 m. as the principal battle range, the angle of opening ought to be 22°;

however if we consider this principal battle range to be 3500 m., the angle ought to be 18°. For the light field howitzer these angles would be 37° and 30° respectively. The angles of opening of the German light gun and howitzer correspond best to a principal battle range of 3500 m.; for the French light gun to one of 4000 m. The size of the most favorable angle of opening therefore depends upon: (a) the range considered as the principal battle range; (b) the size of the targets which are considered as the most important at this range; (c) the angle of fall at the principal battle range; (d) the striking energy considered just sufficient to disable a man.

From the above it is seen that the ordnance constructor must know what the tactician has to say to enable him to design a projectile of maximum efficiency.

SHUKRI PASHA

Shukri Pasha, the famous Turkish commander, who conducted the heroic defense of Adrianople in the first Balkan war, having held out against immense forces for the five months, was reported (Jan. 11) to have been wounded in the fighting in the Caucasus and to be a prisoner in Russian hands. About a year ago Shukri Pasha was forced into retirement by Enver Pasha and the Young Turks, who were jealous of his fame. He returned to his birthplace, Albania, where he remained until called back into service during the present war. Shukri Pasha served in the French army and also in the German army. He was often commended by Emperor William I. and also by the present Emperor, who visited Constantinople and remarked the excellent results of Shukri's training.

SIDE-ARMS

See

CAVALRY—ARMS—SABER

SIDERURGY

See

STEEL—USE OF IN THE MANUFACTURE OF ARMAMENT

SIEGE ARTILLERY

See also

FORTIFICATIONS—PERMANENT
FORTRESS ARTILLERY
SIEGE OPERATIONS
"SKODA" MORTARS

—Laying—Platforms

[Notes on the Laying of Double-deck Platforms for 6-inch B. L. Howitzers. By Temporary Lieut. H. S. Rowell, R. G. A. *Jour. Royal Artillery*, July, '15. 500 words. 1 diagram.]

Platforms usually are laid at night and in darkness. In order to do the work well, a definite system should be followed.

More than 12 or 16 men are unnecessary as they get in the way of each other. Each man should be detailed for a specific duty in connection with a definite part of the platform.

Each transom, plank, and ribbon should be numbered or otherwise marked that it may be brought up without confusion to fit easily into its proper place.

In marking off the platform the line of fire may be indicated by lanterns placed in front of the platform. Pegs then are placed to mark the four corners. By laying the side ribbons and transoms in place temporarily, the transom trenches may be marked off and dug. If the pieces have been numbered and laid out systematically the platform is put together easily and quickly.

—Maps for

[Preparation of Maps for Siege Artillery. By Capt. Giuseppe Gianni, Italian Artillery. *Rivista di Artiglieria e Genio*, Apr., '15. 6500 words. 7 figs.]

(NOTE.—Further technical details of the methods suggested will be found in the text of the article.)

Siege artillery requires at least topographic maps, and firing charts based upon them. These must usually be prepared on the spot, and sometimes without any large scale map upon which to base them.

If a good map is available, the first step is to locate on the ground as many suitable points as possible, shown thereon, and use them for determining the position and altitude of aiming points, battery positions, etc. The primary triangulation stations should be so selected that the sides of the triangles shall not exceed 4 or 5 km., and the angles not be less than about 20°.

Generally, the points thus located may be plotted in the usual manner, but it may be desirable to refer them to orthogonal Cartesian co-ordinates. It is most convenient to select one of the primary points as origin, and a side of one of the primary triangles as axis of ordinates; sometimes it will be well to determine the precise azimuth of the base by astronomical observation.

If, while a large scale map is available, the trigonometric data of the points are not given. a few points are selected and located on the ground, and the distances between them determined. Direct measurement is generally impracticable, and an auxiliary base must be measured with considerable accuracy. Altitudes of some of the points may be found on the map. or on local records; those that seem most reliable should be selected. The data will not be sufficient to calculate azimuths; where these are necessary, a north and south line may be laid out with sufficient accuracy by observing the sun in the morning and again in the afternoon when at the same altitude, and bisecting the horizontal angle.

The maps thus prepared must be marked with meridians and parallels, at intervals of 20' and 15', respectively. If the area is small, right lines will do for parallels; if it exceeds 8' or 10', their curvature should be considered. As a guide in drawing and marking the lines on each sheet, a small scale map of the entire area should first be prepared and ruled.

On each sheet the magnetic north should be marked, and the mean declination of the compass noted. Too much reliance should not be placed upon this for artillery purposes, the declination being so variable.

The map sheets being completed, firing

SIEGE ARTILLERY—Continued

charts may readily be prepared, several at a time by pricking through the desired points.

If no large scale map at all can be found to use as a basis, time and facilities will usually not permit the extensive surveys necessary to make one. About all that can be attempted will be the preparation of firing charts. As many points as possible will be plotted as above described using an auxiliary base. Simple differences in altitude are hardly sufficient for artillery purposes; if actual elevations cannot be found in local records they may be taken barometrically. The meridian may be plotted by compass the declination being known; or it may be found by bisecting the angle of equal shadows. The charts may be ruled in squares of 450 m.

In locating targets and observing fire with such charts it is best to use two observers at base ends; a single goniometer and a one-man range finder are hardly accurate enough.

It is of interest here to note a method of locating on a contoured map the possible positions for a battery to reach a given target. This is by means of the curve known as the *counter-trajectory*, which is obtained from the equation of any trajectory by using the point of fall as origin and substituting negative values of x; the curve, of course, always passes through the origin of the original trajectory. If we project points of this curve upon the axis of abscissæ, and note the ordinates along the edge of a card, place the origin at the target on the map, and revolve the card about it, when a division on the card corresponds with a contour of corresponding number we have a possible battery position. For greater accuracy, graphic tables of counter-trajectories may be prepared, taking into account the variation of the trajectory for height of gun and target.

To mark all possible positions on the map is not a matter of great difficulty, since for each gun we need consider only the trajectory corresponding to maximum charge and elevation, and may disregard all ground outside the sector of attack. The ground effectively beaten by all located batteries of the enemy may be marked on the map, and only positions outside these areas noted.

—Organization

[How can the Royal Garrison Artillery be best organized to take part in an Expeditionary Force, in the event of it not being required for coast defense, and what extra training, if any, is necessary for its preparation for such service? By Captain P. R. Sargeaunt, R. G. A. (Duncan Commended Essay. 1915.) *Jour. Royal Artillery*, July, '15. 3500 words.]

For the purposes of this essay, the R. G. A. must be taken as it was in July, 1914. At that time it already included certain heavy and siege batteries, organized and trained to take the field; and we are concerned only with those companies that manned the Coast Defenses or movable armament.

In case they were required to take part in an expeditionary force, these companies would be called upon to form heavy and siege batteries. When so required, drafts from various companies now are amalgamated into batteries indiscriminately, and the result is a number of units in which the personnel are strange to each other, and unused to the work expected of them. Such a battery requires a period of training before it is fitted to take part in an expeditionary force. This training is particularly necessary to any battery dependent upon horses and drivers for its mobility, since the drivers are drawn from the Territorial or Reserve forces and the horses from the plow and the lorry.

It is impossible to say before the outbreak of war how many Garrison Gunners could be spared from the Coast Defenses. Any system of organization devised must be universal, so that any garrison taking the field may do so as a unit. The strength of the coast defense companies varies from 100 to over 200 men, and the number of companies at a given station may be from one to eight, depending upon the needs of the station.

The garrison at any station may be divided into batteries for service with an expeditionary force in two ways:—

The first method is to leave unaltered the present establishment of Coast Defense Companies and form the batteries by combining the coast defense companies on a principle of "Give and take."

The second method involves some radical changes in the organization of the Garrison Artillery, the idea being to make the establishment of the coast companies the same as that of the batteries they will become in the expeditionary force.

The latter method has the disadvantage that the strength of these companies is fixed in accordance with the gun manned upon mobilization. But these companies exist primarily for coast defense and their efficiency in that respect must not be allowed to suffer. The coast guns might be re-allotted to companies in such a way that the new establishment would be adapted to coast defense.

The second method simplifies the organization for war and also for peace training. The strength of the companies will vary with the nature of the siege or heavy gun to which assigned. The companies should change station as units, and care should be exercised that batteries relieving one another at any station correspond in establishment.

The proportion of the different natures of potential batteries maintained at the coast defense stations must correspond with the proportion in which such batteries are allotted to the divisions of the expeditionary force.

In order that the batteries formed from coast defense companies be ready, the guns and equipment must be permanently in their charge.

A certain amount of training will be required to render these coast defense batteries fit to take the field when required. This training will include some preliminary instruction to train specialists, drivers, and non-commissioned officers, and some gun drill and fuse

setting. The battery then would proceed with battery instruction in fire discipline, supply and replenishment of ammunition, internal communications in the battery, fire tactics, and field engineering.

Although this extra training is required, the training of the batteries for their coast defense work must not suffer.

The training of specialists, and instruction in gun drill should be carried on throughout the year as opportunity arises, but in addition thereto, for a period of four weeks the battery commander should have his entire battery free from routine duties and available for training as a unit. This period should be allotted as follows:

1st week—Section gun drill.
2nd week—Battery drill.
3rd week—Fire tactics.
4th week—Section and battery practice.

At least during the last half of the period, the horses or tractors should be available for use of the battery.

While the scheme of training outlined above cannot be expected to turn out first class batteries, it would do something toward rendering the Royal Garrison Artillery better fitted to take the field with the expeditionary force.

[How can the Royal Garrison Artillery be best organized to take part in an Expeditionary Force, in the event of it not being required for Coast Defense, and what additional training, if any, is necessary for its preparation for such service? By Captain H. W. Roberts, R. G. A. (Duncan Commended Essay, 1915.) *Jour. Royal Artillery,* Aug, '15. 6000 words.]

The Royal Navy must have absolute command of the sea before it can be said that the R. G. A. are not required for coast defense, and it also must be absolutely certain that outside international complications will not occur if coast forts are to be left unmanned. At the outset of any campaign in which a British Expeditionary Force takes part, as we cannot be sure that international complications will not occur, it may be taken for granted that R. G. A. coast defense units will seldom be in a position to mobilize at the same time as the expeditionary force. Thus the work assigned the coast gunners must be such that the expeditionary force will not be seriously hampered by the absence of the gunners for the short period at the start, and also it must be such as will best supplement and strengthen the units of the expeditionary force.

Any proposed organization must not militate against the efficiency of coast defense companies in their primary duty of manning the coast defense guns.

A certain nucleus of each company must be left at headquarters to care for the coast armament in order to avoid waste of time and the hampering of the mobilization for service abroad, due to complete transfer of the armament to territorial units.

It is impossible to lay down any general organization, such as arranging that each coast defense company should form some field unit, as no two companies are of the same size; but each coast defense command must be considered separately with reference to the number of men which can be spared and the type of work to be undertaken.

The best way to fit the R. G. A. coast gunners into a scheme for an expeditionary force is to form them into suitable units and definitely allot these units to divisions of the expeditionary force. The coast gunners then automatically go abroad with their divisions, and in peace time would regard themselves as part of these divisions.

At the present time the R. G. A. at home is organized as follows:

(a) *Coast defense units.*

(1) 34 R. G. A. companies grouped together in coast defense commands at defended ports. These companies are not all of the same size but their establishments are suitable to the guns manned. The headquarters of the companies do not change station but the personnel is changing constantly.

(2) Two Special Reserve Units.

(3) 76 Territorial companies and 6 Territorial heavy batteries allotted to various defended ports.

(b) *Heavy Artillery Units.*

(1) 6 regular heavy batteries and ammunition columns organized in two brigades in peace time; but in war time one battery goes to each division.

(2) 14 territorial heavy batteries, exclusive of those in (a) (3), and 14 ammunition columns allotted as divisional artillery to territorial divisions.

(c) *Siege Artillery Units.*

A nucleus of two siege brigades, one heavy and one medium, the peace organization being two companies for the medium and one company for the heavy brigade.

(d) *Mountain Artillery.*

One territorial mountain artillery brigade and ammunition column forming part of the divisional artillery of the highland division.

(e) The *record office* is at Dover and there are four R.G.A. depots.

Abroad. The R. G. A. coast defense companies (50 in number) are allotted to various defended ports and forts. In India there are 6 heavy and 21 mountain batteries, and in Egypt one mountain battery.

Of the various R. G. A. units, the six heavy batteries at home are allotted to divisions and already form part of the expeditionary force. Each siege company will be expanded into two batteries and two brigades will be formed, one a heavy siege brigade of two heavy howitzer batteries and the other a medium siege brigade of four medium howitzer batteries, and two ammunition columns. These siege batteries will be supplemented by others as needed, and we thus may take it that the R. G. A. is to be turned into a large siege train, if the coast guns are to be left unmanned and a large siege is to be undertaken.

SIEGE ARTILLERY—Continued

The present European war proves the immense value of well managed heavy guns, and another feature brought out prominently is the need of anti-aircraft ordnance. Regular anti-aircraft batteries undoubtedly will form part of any future expeditionary force. In the future it is probable also that such guns will form part of the armament of each defended port. So that it would appear desirable so to organize the coast defense anti-aircraft batteries that they can reinforce the anti-aircraft batteries normally forming part of an expeditionary force.

In discussing the organization to enable the R. G. A. best to perform its duties with an expeditionary force, it is well to begin with the siege brigade already existing. These companies now are stationed, one at Gosport and two at Plymouth. At present men do not stay their whole time on siege work, which necessitates a large amount of clerical work on the part of the Record Office in keeping track of the trained siege men needed to expand these companies at mobilization. To obviate this, suppose the siege brigades be based permanently on the Southern (Portsmouth) Coast Defense Command, our largest, the two companies at Plymouth being moved to this command.

In the Portsmouth command there are in peace time 11 regular coast defense companies (74 officers and 1712 men), in addition to territorials. If all the men of this command be trained for a period in siege artillery work, it would be possible to expand the siege brigade to its war strength, form the companies of this command, and still leave a good sized nucleus to continue on coast artillery work.

Each existing siege company would be divided into two sections, each of which forms the nucleus of a siege battery upon mobilization. All company commanders concerned are supplied with lists of men who join the siege batteries upon mobilization, and these lists must be kept up to date. It is essential that each man know his exact place in the mobilization scheme.

In order to insure that men trained for siege work would be available for the siege brigades, it is suggested that the Southern Coast Defense Command be linked to coast companies in the Mediterranean Command and all foreign reliefs be arranged between these home and foreign companies; so that when the men complete their foreign service they would go back to the Southern Coast Defense Command where they had received their preliminary siege training.

In a similar manner siege and heavy artillery units might be formed in other coast defense commands and be linked to heavy batteries for assignment to the expeditionary force, and with coast companies on specified foreign stations for their foreign service.

It would be necessary to keep a small nucleus for each of these supplementary heavy and siege batteries in the coast defense commands, and the officer in charge of these details should be responsible for keeping up the lists of personnel for his battery, and also for maintaining the efficiency of the specialists and riders, and keeping the material in good condition. The training of the battery as a whole would be carried on under his supervision for a period of one month a year. A small portion of the men might be attached to the linked battery for maneuvers each year in order to acquire the necessary experience in field work.

In a scheme along these lines, officers and men still get a general education in coast defense work, but in addition they specialize on the work of some field unit. This would broaden their outlook on the service and add additional interest to the coast defense work of the Royal Garrison Artillery.

—Range Finding

See also

GONIOMETER

SIEGE OPERATIONS

See also

SIEGE ARTILLERY

—Duration of

[Length of Fortress Sieges. *Army & Navy Jour.*, Oct 9, '15. 300 words.]

Sieges have lasted as follows: Crimean War, Sebastopol, twelve months; Franco-Prussian War, Strassburg, seven weeks; Metz, two months, eight days; Paris, 130 days. The siege of Port Arthur lasted seven months. It took the Russians four and one half months to capture Przemysl. On the other hand, according to the bulletin of the German Information Service the Germans have greatly reduced this time, citing Liége, two days; Namur, two days; Antwerp, twelve days; Kovno, twenty days; Novo Georgievsk, ten days. The Dardanelles fortifications have withstood the guns of the French and English. The bulletin does not give data in regard to Tsing-Tao, which resisted siege by the Japanese from Aug 25 to Nov 7, 1914.

—Engineer Troops in—Use of

[Italian Regulations for Siege Warfare—Concluded. Appendix II, Regulations for the Employment of Engineer Troops. Official Publication. *Mitteilungen des Artillerie u. Geniewesens*, May, '15. 15000 words.]

These regulations deal with the organization and duties of engineer troops during an attack upon or defense of a fortress and include matter pertaining to technical formations that, on account of their peculiarity and importance, require special mention.

The engineer siege park contains sapping, mining, bridge, telegraph, radio and aeronautical equipment, and tools for the repair and manufactures of matériel. In addition, it contains matériel for lighting and water supply and transport of all kinds. The engineer park is divided into sections, and upon joining the besieging force is subject to the orders of the chief engineer of the siege. The latter is assisted by a number of engineer officers, one of whom is detailed as Engineer Chief of Staff of the siege. The chief engineer of the siege directs all engineer operations and

should be prepared to submit the necessary plans for these operations. These include the determination of the composition of the engineer siege park and the strength of the engineer personnel.

The engineer chief of staff is charged, among other things, with the direction of the special technical tasks of the engineers, i.e., topography, communication, supply and transport. He likewise keeps up to date all information available of the fortress and the country surrounding it, sifts and edits information bearing on engineer operations, and keeps the diary of these operations.

The topographical bureau, under the direction of the engineer chief of staff, keeps up to date with special reference to engineer operations, the general and special maps of the fortress and of the country surrounding it.

The detailed reconnaissance for engineer operations that is undertaken by direction of the chief engineer of the siege during the approach to the fortress should furnish information on the following:

(a) Character of the terrain near the fortress; suitability of the roads, etc., for the passage of heavy transport and the extent of necessary repairs, bridging, etc.; the direction and character of railways, telegraph and telephone lines; the means necessary for repairing such communications; suitable crossings over water-courses; tactically strong or otherwise advantageous points; defiladed and open areas; defiles; localities suitable as supporting points for the investing line, etc.

(b) Location and type of the works and batteries of the fortress; their power of resistance and their probable armament; whether any of the batteries are protected by armor; approaches, etc., etc.

(c) Localities suitable for parks, magazines, laboratories, depôts for matériel, hangars, etc., etc.

All information gathered is noted in drawings elucidated with appropriate legends, and transmitted to the topographical bureau. The latter combines this with such other information as may be available, and prepares a topographical map with this information noted thereon for the commander of the siege. The latter transmits a copy of this, with such information as may pertain to the artillery arm, to the commander of the artillery.

The chief engineer of the siege establishes himself where he can best carry on his work, always maintaining close communication with the commander of the siege.

In order that he may be able to give an opinion as to the best direction for the attack, the chief engineer of the siege orders a detailed reconnaissance to be made by engineer officers. In this, special attention should be paid to the following:

(a) The terrain surrounding the fortress and its suitability for the purposes of the attack; (b) the hostile works and other defensive establishments—this to complete or to piece out the information gathered in time of peace or during the approach; and (c) the communications in general, especially those necessary for bringing up siege material.

In the work of investing the place, care should be taken to utilize to the best advantage the terrain and any material that may be available on the ground, in order that time and energy may be saved. As in field warfare, all work should be systematic and should follow a rational plan, in so far the enemy's activity allows. The following is the relative order of importance of work undertaken:

1. Increasing the effectiveness of the fire of the attack;
2. Construction of obstacles;
3. Cover against hostile fire;
4. Measures to facilitate the advance.

The chief engineer of the siege should submit recommendations to the commander of the siege as to where matériel and personnel of his corps and the engineer park and its subsections (except those assigned to attack sections) are to be posted, and exercises direct command over them. One section of the engineer park is assigned to each attack section and is directly under the orders of the chief engineer of that section, who also directs all engineer operations within it. If necessary, the engineer of an attack section calls upon the commander of the troops thereof for such military labor as is requisite for executing engineer work in hand.

Plan of attack. In order to furnish the commander of the siege with the technical information that he needs in formulating his plan of attack, the chief engineer has the information already available made complete. He should then be prepared to furnish information in regard to the following: The best direction, from a technical viewpoint, for the main attack; the location of the first and succeeding infantry positions; the artificial and natural covered approaches to the first infantry position; the best means for removing or surmounting obstacles; the best method of concealing and housing the troops; the most advantageous disposition of the engineer troops and of the engineer matériel, etc.

As soon as his recommendations are approved by the commander of the siege, the chief engineer issues the orders necessary to carry them into effect.

During the approach to the first infantry position, engineers assist in cutting roads, demolishing obstacles, etc.

In case an advance can not be made in any other way without heavy losses, the chief engineer should recommend that sapping be employed. Saps should be properly defiladed and should lead to the strongest tactical points that will form the framework of the next parallel. In general, the single sap should be used. In the most dangerous localities, however, the double sap may be used, or a form of sap without a parapet, or one in which the parapet is replaced by steel shields.

The chief engineer submits a schematic sketch of each new infantry position for the approval of the commander of the siege. The engineer of each section is then furnished the portion thereof that pertains to his section, and supervises the execution of such work as is to be done.

SIEGE OPERATIONS—Continued

Engineer officers are posted at sap heads to supervise work. Saps should be extended at night.

Sapper or mine detachments commanded by engineer officers who reconnoitered the obstacles that need removal, are assigned to heads of assaulting columns. To insure success, other engineer detachments follow the first as supports.

Sap heads are, if necessary, protected by infantry equipped with portable steel shields. Mine work should be similarly protected, being executed, when practicable, with electric drills.

Defense. In defense, the duties of engineers comprise clearing the foreground, placing in readiness all permanent works, construction of field works and obstacles, repair of roads, bridges, mining, preparation of telegraph and telephone lines, and construction or preparation of cover for troops and matériel.

The chief engineer of the fortress supervises all engineer operations of the defense. He is assisted by a chief of staff who performs duties similar to those of the corresponding officer in attack. A war diary of engineer operations, divided into parts relating respectively to personnel, matériel, and work, is kept by him.

The senior engineer in each sector of defense acts as chief engineer of that sector. His duties are similar to those of the corresponding officer in attack.

The engineer troops in the fortress are charged with supplying the garrison with drinking water during the entire duration of the siege.

Timely reconnaissances are made to determine the principal attack direction, and the chief engineer then submits recommendations to the commander of the fortress in regard to the work that should be done to strengthen the defenses, etc.

When an assault is to be expected, engineers should rapidly construct suitable countermines, and at night should illuminate the foreground that will, in all probability be used by the enemy. For this purpose they should use searchlights, acetylene lamps, flares, etc.

When a work is about to fall into the hands of the enemy, the engineers should damage or destroy it and all the matériel and instruments that it contains.

SIGHTS

—Rifle

See

INFANTRY—ARMS—RIFLE—SIGHTS

SIGNALLING

See also

COAST DEFENSE—INFORMATION SERVICE

—Audible—Under Water

See also

FESSENDEN OSCILLATOR

—Electrical

See also

WIRELESS TELEGRAPHY

—Electrical—Buzzers

[The Service Buzzer. By the School of Fire. *Field Artillery Jour.* Apr.-June, '15. 2000 words. 3 figs.]

Experiences in the European war indicate that the buzzer is more reliable than the telephone or visual signaling. The service buzzer weighs 5 lbs. Current is provided by two dry batteries. The induction coil and interrupter are mounted over the batteries together with two condensers, sending key, receiving key, transmitter and receiver with cords. The instructions for use accompany each instrument. Usual troubles are due to rough handling, weak batteries, short circuits. Troubles may be either in the buzzer, connectors, or line. To locate these troubles, a knowledge of the circuit, and construction must be had. In emergency, certain makeshifts may be used to maintain communications. Dry cells are usually unserviceable after six months.

—On the Battlefield

[Intercommunication on the Battlefield. By 1st Lt. Alfred K. C. Palmer, 1st F. A. *Infantry Jour.*, July-Aug., '15. 3500 words.]

It is desired to call attention to some definite uses of the personnel and matériel now in the service and to suggest a few additions to the equipment in order to secure the well recognized need of communication between the various arms in the field. The French use an officer called "orientation officer," who is an artilleryman specially trained in infantry combat. Gen. Joffre's system of communication distinguishes between communication "upward" and "downward." Mounted messengers, telephones and signal details are included, and the system was adopted for the whole army. Communication by superiors is the simplest to consider, as it is readily acplished by regular route. But after the artillery positions are assigned, communication between subordinates is necessary. In simple cases, a preliminary conference of commanders is sufficient. Once communication is established with any unit of any force, then that unit should be the one to send and receive communications. The risk of causing confusion is too great for an unnecessary change of communication from the battalion say, to the regiment.

There are roughly speaking two classes. Communication beyond 5500 yards, the extreme range to be used, and communication within the fire-swept zone. The first needs no discussion. The second is so generally treated in the regulations as to leave much to be desired as to exactly how we may expect smaller units to be actually and promptly brought into contact during combat. A thorough system worked out among the smaller units would be applicable to the larger units. The reconnaissance officer of a battery is the best available and most competent man to send forward. There should be more than the two 800 yard spools of buzzer wire. If wire cannot be used, then flags must be used and some method instituted so as not to leave it to some "preconcerted signal" immediately

prior to the fight. The Field Artillery Board suggest three simple messages, sent by a simple special flag as a means to secure this correlation on the field. The messages are (a) we are about to retire; (b) we are about to advance; (c) artillery fire is causing us losses. The proposed flag on a wire frame is a square piece of cloth, always khaki color on enemy's side, with two square pieces, one red, the other white, so sewn at certain of the edges and on the diagonal as may be, as to make possible the showing of a red square, a white square, a red and a white square—for the above messages.

The communication between a single battery and the infantry has been shown. For communication between a battalion of artillery and the infantry force, the battalion adjutant should be sent. For communication among the batteries of the battalion, of course the lieutenant most fitted for the work must be used. The Serbs used flags effectively, also fired straw stacks and brushwood, to signal changes of position, etc. The Bulgarian system of communication apparently did not work well, as shown by losses due to their own artillery fire. The present war in Europe seems to award the greatest efficiency to the telephone and the buzzer, but these engagements amount almost to seige operations and deductions made are apt to be too local. —**Visual**

[Field Visual Signalling for the Line of the Army. By Lieut. W. R. Wheeler, 15th Inf. *U. S. Infantry Jour.*, May-June, '15. 8800 words.]

There exists a great diversity of opinion regarding the powers and limitations of visual signalling. Nowhere in our manuals do we find a compact discussion of the subject. Great Britain discusses it in a pamphlet of 200 pages, the results of a dearly bought experience in mountain warfare in India and on the plains of South Africa. Except for brief messages, signalling over distances less than 1000 yards is a mistake. The only justification of short distance signalling is warfare in hilly country or the existence of a ravine, river or fireswept zone which would limit the employment of orderlies. The above tactical observations are from the British manual; our own contains clear descriptions of code and equipment, but no mention of the tactical use of visual signalling. The subject, though scattered, is remarked upon in the Drill and F. S. R., a careful study of which gives an idea. It is a question whether the instruction thereunder should be left to the individual judgment of every company commander.

Each regiment is responsible for communication back to the brigade and forward to the battalions. The equipment is excellent. The jointed staff gives trouble, but a substitute can readily be found. There is plenty of personnel in each regiment. However, the consensus of opinion is that our signalling is in a bad state. In an endeavor to ascertain the trouble let us investigate under the heads of:

1. Code, including "conventional signals."
2. Flagging.
3. Transmitting.
4. Supervision, and individuals to be instructed.

1. The "General Service Code" contains 68 symbols, of which we need 26 for the letters and 3 for the comma, the period, and the question mark. Why the extra 39? If we reduce these 68 to 30 or 40 we get within range of the average man's ability to memorize the code and to transmit messages. It seems inadvisable to have two systems, and it should be noted that the other system, the semaphore, uses but 4 more symbols than the alphabet, as against the above-mentioned 42.

2. Flag waves for dot and dash depend upon direction of flag movement; the dot to the right, the dash to the left. If these motions are not clean-cut—and it is hard to make some men realize that the flag must not slip by the vertical when returning from a right or left wave—then the slight movement beyond the vertical is often received as a complete wave toward that side. A concrete case is the letter "t," which can be easily read "n" if carelessly sent. Many men start off with a preliminary movement which is received as "a" instead of the intended "t." Inter-company practice at the prescribed distance of one mile and under proper supervision will correct this and improve our present system. This method depending upon direction of flag movement, can, of course, be read only by observers who are in front of the flagman. European services consider this a disadvantage; an advantage is its availability for use under fire by a man in the prone position.

The system of the Germans and the English is to make the dot and dash depend upon length of flag movement; a short wave for the dot, a long wave for the dash. At a distance these lengths would be distinguished by using a good glass. From the prone position this system might be difficult. Lengthy and impartial experiment by line troops would alone determine this. The cure for the awkward reverser reading is obvious, the sender should stand with his back to the receiving station. Practice will overcome the difficulties in signalling from a prone position. This will always require two men, but do we not habitually use two? The assistant thus faces the sender with corresponding gain in accuracy. The British further insure accuracy by assigning distinctive sounds to certain letters as given by the assistant to the sender, *i. e.*, "t" is pronounced "toc" and "m" is "emma."

Transmitting is rendered more accurate and is not slower in spite of the extra work, by requiring the receiving station to repeat each letter. This "repeat-letter system" was demonstrated beyond doubt to be practicable. It allows speed of sender to be regulated by the receiver, and in transmitting messages, the receiver is obviously the one to be considered. The sender can be stopped at any time to allow of a change of detail or to counteract obstructions of signals. Paragraph 31, Circular 3, Chief Signal Officer, is too complex for the average private of the line. The repeat-letter system obviates the check number. This repeat-letter system is said to have been used by the British during the Boer war. As a

SIGNALLING—Continued

result of this war the number of signallers per company has been increased from 2 to 4. Signallers in the British army receive higher pay.

In view of the lamentable condition of visual signalling in our army, it is believed that the Drill Regulations should state the following: that each man be required to know, transmit and receive the 17 letters of I. D. R. 47, and that four men per company be detailed and consolidated for instruction under an officer.

This procedure means economy of effort and efficiency of instruction. Instead of twelve officers conducting the drill along twelve different lines, one officer conducts the work in a uniform manner. There are many things more important than signalling, and yet signalling is too important to be used simply as a "filler-in." An officer of the battalion staff should be detailed for the work. His two or four men per company should report on designated days or every day. He should be held responsible for progress. Relief from fatigue or stripes to be sewed on sleeve might stimulate the interest of the men.

This article, written in great part three years ago, is sent in due to the impetus received in noting the remarkable work done by British in the "International Maneuvres, near Tientsin, November, 1914."

Suggested rules for visual signalling:

1. Learn the alphabet, numerals, period, comma, question mark.
2. Send each letter slowly and exactly.
3. Flagman stand with back to receiver, assistant facing him.
4. Have each letter repeated back.
5. For error signal "dot dash dot dash dot dash dot dash," and start work again in which error occurred.
6. Never practice within speaking distance.
7. As efficiency is attained, devise symbol to cut out the repeating of each letter.

—Visual—By Illumination

See also
ROCKETS
SEARCH LIGHTS

—Visual—By Illumination—Apparatus and Equipment for

[Types of Apparatus for Visual Signalling in the Field. By Capt. Aristide Luria, Engineers. *Rivista di Artiglieria e Genio*, Mar, '15. 9000 words. 10 drawings.]

The apparatus here described are all recent; earlier ones have been described in previous articles.

English Signal Lamp.

This is a portable lamp with three different systems of illumination, giving different intensities, for use by day and night. The systems are: acetylene flame, for short distance; incandescent lime light, for medium distance; Change is made instantaneously. Signals have been read, in daylight, at 25 km.

The acetylene generator is merely a small tin box containing carbide. To use it, the ends are pierced with an appropriate instrument, and the box placed in water. Superfluous gas escapes freely; in case of failure to function, oxygen can not penetrate into the generator. The oxygen is supplied by action of water upon sodium trioxide; pressure is regulated by a bicycle pump. Both generators supply gas for an hour's signalling.

The shutter is of the ordinary Venetian blind type. The apparatus complete weighs 12 kg.

Acetone-acetylene Apparatus.

Some European countries use acetylene dissolved in acetone; a liter of acetone takes up 24 volumes of the gas for each atmosphere of pressure. The solution is not explosive, acetylene being endothermic and acetone exothermic, so that a balance is maintained. Danger from the inflammable liquid or from explosion of free gas is avoided by filling the container with a specially prepared *kieselguhr*, which contains 80% of voids. The acetylene for this use must be prepared by special processes, to insure the requisite purity. The accumulators used are of special steel, and contain a supply for over eight hours' use.

In the lantern, the gas passes from the accumulator into a pressure regulator, where the pressure is reduced to that required by the burner. A pressure gauge shows the amount of gas remaining. The burner has two jets, one full size, the other a small pilot light, left burning continuously while in operation; a key turns the main burner off and on as required in signalling. Reflectors, lenses and sights are provided, with suitable means for adjustment and control of the light beam.

This appartus is simple, strong, light, durable, economical, safe, certain in action, and easily kept clean and in order.

The Triple Mirror.

By means of this device, a ray of light from a distant source is reflected directly back, without the necessity of accurate orientation of the instrument; it may be used where it is impracticable to carry a lamp of any kind.

The triple mirror is a three sided pyramid; its trihedral angles are cut off so that the base is hexagonal. The three sides are perpendicular to each other, and act as total reflectors. The mirror is so mounted that its base may be brought to face approximately toward the fixed light at the distant station; rays falling upon it are reflected directly back, provided only that the orientation is not so extremely inaccurate that the light does not strike one of the three faces at all. A shutter is provided for giving signals with the reflected ray.

In practice, the three reflecting surfaces are not set absolutely perpendicular; it results that there are two or three reflected rays instead of one, inclined at a slight angle to the incident ray. A mirror giving two reflected rays is generally used; the angle of reflection being fixed, the observer's eye is placed, not in line with the lamp, but at the proper lateral distance from it. Two observers may read at once, one on each side of the lamp; in the usual type of instrument, the eye should be placed 10 cm. from the light for each kilometer of range.

The intensity of the reflected ray varies, of course, as the square of the diameter of the base of the mirror. Two sizes are made, 85 mm. and 100 mm. With a 50-ampere light, these give ranges of 7.5 and 10 km. respectively by day, and about three times as much by night. With the regulation oxy-acetylene lamp, the ranges are about half as much.

The weights are respectively 4.5 and 6.6 kg., instrument only; the tripod weighs 3.6 kg.

The station provided with a lamp can easily locate the other station, provided its approximate position is known, by moving its own beam slowly and watching for the reflection. Communication is as with the heliograph; the station using the triple mirror can not, of course, send a message except when the light is left on continuously.

Martegani and Ceretti Optical Telegraph.

This is a simple actylene lamp with a converging lens, producing its gas direct from carbide. Water is admitted to the carbide only when gas is required; the generator may remain charged indefinitely. In use, a small pilot light burns continuously, lighting a large flame whenever the sending key is depressed. With a charge of 300 g. of carbide, the instrument will give ten hours' service.

Dry Acetylene Lamp.

This produces acetylene from calcium carbide by the action of crystallized sodium carbonate. The gas produced by the mixture is passed through a chamber containing a purifying agent, and thence to the burner.

—Visual—Errors in

[Errors in Visual Signals. By Sergt. Stuart McLeod, 3d F. A. *Field Artillery Jour.*, Apr-June, '15. 450 words.]

Parts of a message are frequently lost by the receiver, who then signals "Repeat last two words." But in the meantime the sender continues to send and the receiver really has lost more than two words. The receiver should cut in and signal "Repeat after ——," giving the last word correctly received, and thus obviate any errors. It is also advisable to check in the total number of words in a message.

SIKH WARS

[A Visit to Some of the Battlefields of the Sutlej Camp (1845-6). By Maj. W. B. R. Sandys, R.H.A. *Jour. of the Royal Artillery*, Jan 1915. 4800 words, 2 sketches, sketch map and tables.]

This article describes a visit to the battlefields of Moodke, Ferozeshah, Aliwal, and Sobraon, and gives in some detail an account of these battles.

[A Visit to the Battlefield of Chillianwalla and Gujrat, 1849. By Lieut. Col. W. B. R. Sandys, R. A. *Jour. Royal Artillery.* July, '15. 3000 words. Map.]

Chillianwalla is reached easily from the main line of the N. W. Railway by changing at Lala Musa; 21 miles west of which is the wayside station of Chillianwalla. Chillianwalla Village is about 3½ miles due north of the station. The battlefield is marked by several conspicuous monuments erected to the officers and men who fell there.

Toward the end of 1848 the Punjab had burst into flame, and in October "The Army of the Punjab" was formed. After some preliminary battles, the army under command of Lord Gough began its advance northward early in January, 1849. On January 12 it had reached Dingi, about ten miles S. E. of Rasul, where the Sikhs were known to be.

On the 13th, the march was resumed and about noon, as the command was preparing to go into camp near Chillianwalla, the guns of the Sikhs opened fire. The Sikh position was found to extend from Fateh Shah de Chak to Rasul, a distance of about five miles.

The dense jungle concealed the enemy's dispositions and made difficult the maintenance of cohesion between the different British units. The battle was essentially an infantry battle, although the artillery, of which there were 6 horse and 6 light batteries present, rendered good service and met some difficult situations.

By 3 p. m. the British line was formed and the general advance ordered. The right division, owing to the jungle and a misunderstanding of orders, made but little progress. The left did better. Darkness put an end to the engagement and the British line was rectified by withdrawing the advance division.

The next morning the Sikhs were in position near Rasul, but remained passive. For the next month no important move was made by either side and on February 12 the Sikhs evacuated their position. The total British casualties in the battle amounted to 89 officers and 2357 of other ranks.

The battle of Gujrat, February 21, 1849, differed in several respects from Chillianwalla. The terrain was open and the artillery, of which there were 8 horse and 11 field batteries present, took a most prominent part. More artillery was employed than in any battle of the Sutlej campaign or at Chillianwalla.

The Sikhs were in position about 1½ miles south of the city of Gujrat, their line extending about two miles east and west, with cavalry on both flanks.

The British advanced about 7 a. m., accompanied by the artillery, which opened a heavy cannonade on the enemy. By 11:30 a. m., the Sikhs were in flight, and their camp and nearly all their guns fell into the hands of the British.

The total British casualties amounted to 29 officers and 671 of other ranks. This battle ended the campaign and gave to the British the control of the Punjab.

SITUATION (Military)

See also

EUROPEAN WAR—MILITARY SITUATION

—Estimate of

[The Estimate of the Situation. By Rear-Admiral A. M. Knight, U. S. N. *U. S. Naval Institute Proceedings.* May-June, '15. Reprinted in *Professional Memoirs.* Sept.-Oct, '15. 6500 words.]

The "estimate of the situation," which must precede any decision in warfare, differs from the ordinary mental processes which govern our every-day acts only in this—that it is a

SITUATION (Military)—Continued

thorough and methodical course of reasoning along systematized lines, so formal as to insure that no important factor be overlooked. By adherence to a prescribed form in peace training, logical and concentrated habits of thought are developed which instinctively guide a commander's decision, even in the stress of a sudden emergency.

At the Naval War College the estimate of the situation is treated under four heads:

1. Mission.
2. Enemy Forces: Strength, Disposition, Probable Intentions.
3. Our Forces: Strength, Disposition, Courses of Action.
4. Decision.

1. The mission is always the ultimate task which *at present is assigned to us* for accomplishment. Each step directed toward this end constitutes a *secondary* mission which may become *the* mission of a subordinate commander. It is necessary, in certain problems, to recognize an *immediate* mission, leading up to the general mission, which may demand all of a commander's attention for the time being, and thus calls for a new estimate and a new decision.

It is important to grasp the relation between *mission* and *orders*. The success of a commander's plan depends upon the intelligence and skill with which his subordinates execute their parts. The mission, then, will normally be derived from the orders, which must be so clear and comprehensive that there can be no misunderstanding. Conditions may arise to create an entirely new situation, and, in this case the subordinate should modify his mission as may be necessary, always *so as to contribute to the plan which he knows to be that of his superior*. Obedience should be not mechanical, but composed of loyalty plus initiative. It is well if the subordinate be so "indoctrinated" with the principles of his commanding officer as to act instinctively in accordance with them.

Having decided *what to do*, the situation must be carefully studied in order to determine *how to do it*. In peace training, it is important that the whole train of reasoning be written into the estimate, to develop habits of thoroughness. In practice, the treatment of 2 and 3 will often overlap; any *form* must be used with elasticity.

2. Here we have to deal, first with *information*, second with *inferences*. Information must be carefully weighed, and inferences drawn therefrom as to the enemy's possible courses. It is only by considering all of these that surprise can be avoided. The estimate is never for the purpose of justifying a decision previously arrived at.

The following points call for consideration: (a) position and strength of enemy; (b) element of time and space affecting movements; (c) enemy's probable mission; (d) enemy's possible courses of action, advantages and disadvantages of each; (e) enemy's probable decision.

3. Under this heading there should be a thorough examination of those courses of action, and only those, which *lead to the accomplishment of the mission*. The following points should receive attention: (a) position and strength of our forces, compared with (a) above; (b) elements of time and space; (c) choice as to offensive, defensive, or offensive-defensive; (d) courses of action; (e) courses as affected by enemy's probable and possible plans; (f) enemy's reply to courses; (g) other difficulties.

4. The decision is the plan decided upon for attaining the mission. So far as practicable, a commander should endeavor, in making his decision, to *keep the initiative*. The decision having been reached, it is of vital importance that the plan be carried out with firmness and resolution.

There is no code of warfare, no rules which apply to any given situation. Training aims to supply *principles*, and the habit of applying these principles logically to each new situation. In general, there is no single best solution of a problem; all that can be asked of a solution is that it be "acceptable"

[The article concludes with a "Tactical Problem" which illustrates the above principles.]

SKETCHING

See also

PRISMATIC COMPASS

—To accompany reconnaissance report

[Rapid Sketching. To accompany a reconnaissance report. By Captain Santos Rodrigues, General Staff, Colombian Army, *Memo. Estado Mayor* (Colombia), May, '15. 2000 words. Forms.]

A correct knowledge of the terrain is necessary to assure proper tactical dispositions and avoid useless efforts and privations on the part of the troops. Ordinary topographical maps lack many details of military importance and cannot show conditions of roads and fields, due to weather and season changes.

In the field, measurements are obtained by pacing. In determining horizontal and vertical angles, the Peigné compass is the simplest and best. This is a small box compass, provided with sights and with a mirror arranged to reflect the reading of the needle while the line of sight is directed on the distant station. A metal rod suspended from the needle pivot serves as a clinometer.

A base line should be selected near the center of the field to be sketched, and the location of important points determined by intersection. The base line should overlook the terrain and be as nearly level as possible—a road or railroad might serve. The operation is continued from secondary lines until the entire field is covered. Elevations and depressions are obtained from the vertical angles.

To transfer the field notes to paper, a protractor, scale, pencils and eraser are needed. The protractor commonly used is made of horn, circular in form and divided into degrees and half degrees. Having selected a scale suitable for the purpose of the sketch, a meridian line is drawn parallel to one side of the paper and in such position that the sketch will be conveniently disposed. A point on this meridian is selected to represent one extremity of the

base line, and by the protractor the direction of the base line is extended and the other extremity determined according to the measured distance and assumed scale. From each extremity of the base line the angles measured in the field are laid off, and the intersection of the sides of these angles when prolonged will give the horizontal projection of the observed points. The relative elevations having been determined by multiplying the distance between the stations by the natural tangent of the vertical angle between them, the form of the ground can be represented by contours.

The drawing should first be made with pencil and finished in ink. Lettering and signs representing vegetation should be parallel to the base of the sketch W-E. Sketch should be dated and signed.

—Use of Watch in

[The Watch and Its Uses in Field Sketching. By F. C. Jones. *Australian Military Jour.* Jan 1915. 1000 words.]

The author describes the uses of the watch as a compass, as a clinometer and as a protractor. and demonstrates its adaptability for making a reasonably (5%) accurate field sketch.

"SKODA" MORTARS

[Austria's Famous "Skoda" Mortars. *Scient. Amer.*, July 3, '15. 1500 words. Photos.]

"Skoda" mortars, having a caliber of 30.5 centimeters (12 inches) were used in the reduction of the Belgian forts and at Przemsyl. They have great accuracy, and their mobility is such that it takes only forty minutes for dismounting and removal; hence they are in little danger of capture.

The value of these guns can be understood when it is stated that the long Russian siege of Przemsyl ended in victory by starvation of the garrison, while the place was captured by the Germans and Austrians, later, in a short time, by using these guns.

The 12-inch Skoda mortar recoils on its carriage, the recoil being taken up by a liquid brake and the return being by compressed air. The brake is attached above, and the compressor below the gun. The shell weighs 860 pounds and has an initial velocity of 1115 f.s. The maximum range is about 8 miles.

The barrel is built up and has shown great length of life. Some of these mortars have been fired at least four hundred times in this war.

The breech block is of the horizontal wedge type, operating from the right side.

High explosive shell, with a delayed-action fuse, is used. It penetrates deeply before explosion.

The sighting telescope and aiming and elevating mechanism are placed on the left side of the mount, from the back of which hangs the loading platform.

Skoda-Daimler motor cars of 100 horsepower, with four driving-wheels, are used for transportation, and at low speed a 16 per cent grade can be ascended.

Usually the mortar is mounted in a pit, into which it is lowered by winches on its car. The mount is handled in the same way. The entire operation of mounting can be performed in 24 minutes.

The effect of these guns, used on troops, is terrific. In Russian Poland an entire battery of artillery and a large number of infantry were annihilated by a single shell, and men in the vicinity who were not hit by fragments were killed by the intense air pressure and suffocating gases.

SLING

—Rifle

See also

INFANTRY—ARMS—RIFLE—SLING

SMALL ARMS

See

CAVALRY—ARMS
INFANTRY—ARMS

SMOKELESS POWDER

See

EXPLOSIVES
POWDER—SMOKELESS

SONSHI

[Sonshi: The Chinese Military Classic. Trans. from the original Chinese-Japanese by Maj. Geo. H. R. Gosman, U. S. Army. *Jour. Military Service Inst., U. S.*, May-June, '15. 7000 words.]

The translator remarks that Sonshi was the greatest of the old Chinese military experts, supposed to have been contemporary with Confucius. His works have been given much thought by Japanese and Chinese scholars, and there are differences of opinion among them as to the meaning of parts of this treatise. It discusses "First Doctrines," "Strategical Attack," "Military Power," "Vain Use and True Use of Armies," "Combat," "Changes," "Marches," "Configuration of the Ground," "Nine Kinds of Ground," "Attack by Fire" (burning), and "Spies and their Use."

SPAIN

See also

HORSES—BREEDING OF—SPAIN

—Army—Schools

See

SCHOOLS, MILITARY—SPAIN

—Army—Signal Corps

See

WIRELESS TELEGRAPHY—EQUIPMENT AND APPARATUS—PORTABLE

—History

See also

PHILIPPINE INSURRECTION
SPANISH-AMERICAN WAR

SPANISH-AMERICAN WAR

—Porto Rican Expedition

[An Early Visit to Porto Rico. By Maj. Robert Alexander, 17th Infantry. *Infantry Jour.*, Jan-Feb, '15. 5100 words.]

The popular impression of the expedition to Porto Rico is that of a delightful excursion followed by a picnic over palm clad hills. But there was a broiling sun, rain and mud, and the Spaniards, equal in number to our own force, made what trouble they could.

SPANISH-AMERICAN WAR—Continued

July 23rd, Gen. Schwan's command left Tampa, with orders to rendezvous at Samana, later changed to Ponce, which was reached Aug 2. The command consisted of the 11th Infantry, Sharpe's and Caleff's batteries of Field Artillery, and Hospital and Signal Corps detachments, about 1800 combatants strong, but lacking in quality because the reorganization scheme instituted after the outbreak of war had impaired the efficiency of the companies by adding an excessive number of recruits.

Leaving Yauco Aug 9, a hostile force reported at anything between a company and 4000 men was encountered east of Mayaguez, and driven out. Mayaguez was occupied Aug 11, and the pursuit taken up.

Certain lessons in organization and in tactics may be drawn from these operations. The disorganization caused by too many recruits suggests that companies be kept at full strength. The Navy is efficient because its ships are always fully manned. Tactical instruction is hindered by too small companies. In almost any field problem, nothing is left of a company after the proper patrols are sent out. Tactical unity should be preserved. In 1898, six companies were disembarked at Ponce, the other six at Guanica, 20 miles away.

At Mayaguez every unit deployed too soon, and the main body deployed immediately behind the advance guard where it received all the overs. The advance of less than a mile required two hours, and the expenditure of ammunition in a company of the advance guard was 27 rounds per man. The losses were due to the enemy's volley fire, stated by the Inf. Drill Regulations to be inefficient.

This expedition marched 78 miles in 5 days, occupied many towns and defeated and destroyed an equal hostile force, fighting on its own ground.

STEEL

See also

Blast furnace

—Use of in Manufacture of Armament

[Siderurgy and Modern Armaments By Gen. D. L. Cubillo, General of Brigade. *Memorial de Artilleria* (Spain), May, '15. 17,000 words.]

(Note.—This was a lecture given in Madrid on April 6, 1915, and is written in popular, rather than in technical, style. The history of iron and steel is briefly sketched, starting with prehistoric times. The various stages of advancement from the use of small pieces of meteoric iron by primitive peoples to the present state of the art of metal working are pointed out.)

At the middle of the 19th century, artillery had hardly changed at all for two centuries. The law of the powder gas pressures was not known, nor the theory of the resistance of simple and compound cylinders formulated.

Beginning in the decade between 1860 and 1870, Rodman invented the method of casting cannon hollow in molds heated on the outside and passing a stream of cold water through the bore at the same time, thus causing the outside layers to compress the inner and so better utilize the strength of the metal.

Spain was the last nation to abandon the use of cast iron for cannon, the last having been made in 1901.

The house of Krupp was the first to recognize steel as the metal best adapted for use in the manufacture of cannon. Likewise it led in the production of large ingots of crucible steel to be used for this purpose.

The demands of military engineers have been the cause of great advances in siderurgy, and, above all, have caused the development of apparatus for the production, forging and heat treatment of steel which has later been taken advantage of by civil industry.

The production of enormous masses of steel for cannon and for modern armor plate has required the construction of large Siemens furnaces of a capacity of from 50 to 60 tons. The Spanish works at Trubia have one furnace of 50 tons capacity and one of 15, thus enabling ingots up to 60 tons to be produced.

Steam hammers have increased rapidly in size under the demands of the military engineers. The Schneider works installed one of 100 tons in the decade 1870 to 1880, and the Bethlehem works in the United States have recently installed one of 125 tons.

On account of the noise of the steam hammer, Whitworth was led to invent the hydraulic forging press, the use of which has become general in all large works. Krupp has one of 5000 tons capacity, and presses of 6000 tons will probably soon be required.

Much has been said about the relative merits of hammers and presses. It has been claimed, without much foundation, that the action of the press reaches deeper into the piece being forged than does that of the hammer. The press is more sensitive, more rapid and quieter than the hammer and does not require so large a foundation.

The requirements of modern projectiles, which must penetrate modern armor, have necessitated recourse to special steels containing chromium, nickel, molybdenum, vanadium, etc. Results of equal merit have been obtained with open-hearth steel, as with crucible steel. Steel produced in modern electric furnaces should be somewhat better. The heat treatment of projectiles requires special care and involves processes which are secret.

The large armor plates used on dreadnoughts and super-dreadnoughts have necessitated the erection of enormous rolling mills and of forging presses even larger than those used in producing forgings for cannon. That of the Whitworth factory has a capacity of 12,000 tons.

It is believed that the limit in size of armament has not yet been reached. Cannon of 40 and 45 cm. caliber are already projected. By the law of similitude, their projectiles will weigh 920 and 1306 kg., and, assuming a muzzle velocity of 890 meters per second, their muzzle energies will be 37,240 and 52,739 kgm.

Siderurgical industry will meet the new demands; if present installations are insufficient

to meet the requirements, they will be enlarged.

[Siderurgy and Modern Armaments. Leandro Cubillo, Brig.-Gen. *Memorial de Artill.*, Madrid, May, '15. 11,000 words.]

The author traces the history of the extraction of iron from its ores from prehistoric times to the present century.

It was first known to man in its meteoric form.

The East Indians were the first people who tempered their tools.

Krupp first suggested the use of steel to replace cast iron in the manufacture of cannon. Cast-iron cannon under Rodman reached the limit of their perfection. Steel ingots increased in size from 3 to 60 tons. Machinery has developed—steel hammers of 125 tons and 10,000 ton presses have replaced the primitive stone tool; laborers with crowbars have given way to 180-ton electric cranes.

The author reviews the struggle for supremacy between projectiles and armor plates.

SPERRY DRIFT INDICATOR

[The Sperry Drift Indicator. By Neil MacCoull. *Aerial Age*, Aug. 16, '15. 600 words. Diag. Illus.]

In steering the aeroplane by compass alone there is no correction for drift, and no way of calculating it except by use of a map; so that, in a flight over unknown ground or over water of such extent as to preclude the use of landmarks, a pilot frequently finds that he has been thrown to the side by a cross wind more than he has calculated.

The Sperry Gyroscope Company has devised a drift indicator that shows the exact direction of travel. It consists of a prismatic monocular telescope mounted in such a way that a clear vision of the ground below may be obtained. When looking through the telescope, which is so made that it is always in focus, five fine parallel hairs are seen across the field of vision. On account of the speed of the aeroplane, every object seen through the telescope passes so quickly that it looks like a line. In using the indicator it is simply necessary to turn the telescope in its frame by a handle until the hairs are parallel to the streaks passing the field of vision. A pointer secured to the telescope makes it possible to read on a graduated scale the angle between the true course taken by the aeroplane and that indicated by the compass. By a device connecting this instrument with the compass, the pilot is able to correct for drift and keep the machine in the desired course. The weight of the combined instruments is only seven pounds.

STAFF

See also subhead STAFF *under subhead* ARMY *under names of specific countries*

STERILIZATION

—Of Water Supply

See

WATER SUPPLY—STERILIZATION

STRATEGY

[Strategy and Grand Tactics. By Capt. Chas. W. Raymond, C. E. *Professional Memoirs*, July-Aug '15. 10,000 words.]

[This lecture was delivered at Yale University in 1882, and is reproduced at this time because of the clear and concise statement it gives of the essential principles of the subject matter and its present value and interest, notwithstanding the period which has elapsed since it was prepared. It discusses the development of tactics from Greek and Roman times, as affected by changing armament and conditions. It is presented in a non-technical way that renders it of particular value to the layman.]

See also

FORTIFICATIONS — PERMANENT — STRATEGIC VALUE OF
RAILROADS—STRATEGIC
SURPRISE
SITUATION (MILITARY)
TACTICS

STREET FIGHTING

[The Tactics of Street Fighting as Applied to Eastern Countries. By Lieut.-Col. W. F. Bainbridge, D.S.O., 51st Sikhs. *Jour. of the United Service Inst. of India.* Jan 1915. 6500 words.]

Street fighting on a large scale between organized forces is very improbable in the future. In the past, the fate of cities was generally dependent upon the issue of battle in their vicinity, and this is likely to be still more true in future.

In large cities, street fighting is likely to be confined to crushing the resistance of the hostile population and of disorganized bands of soldiers.

Compact blocks of houses not only impede the movement of troops seeking to crush resistance, but afford shelter to the opposing side. The difficulties of communication and co-operation between troops separated by blocks of buildings are generally accentuated in Eastern cities with their narrow and irregular streets. Street fighting in such cases is very apt to prove dangerous and costly.

It is extremely unlikely that the Army in India may ever have to meet regular troops in this kind of warfare. The questions of subjugating a hostile population might, however, arise under certain conditions, such as might have confronted the allies in Peking, had not the Boxer rebellion collapsed.

In operating against a large city filled with well armed but probably disorganized bodies of men who may be expected to offer strenuous resistance, it is essential that the ground be known. As reconnaissance is impossible, recourse must be had to maps, plans, or guides.

If high walls surround a city, as is often the case in the Far East, possession must first be obtained of one or more gates. The attacker may then either secure the remaining gates and clear the city section by section, or drive through the city in a given direction and pursue those that come out on the farther side. The first alternative involves dispersion but offers certain and substantial results, the sec-

STREET FIGHTING—Continued

ond requires fewer troops, is likely to entail fewer casualties, and, if cavalry is available, would probably be adopted in most cases.

A street may be likened to a defile the sides of which are held by the enemy. To assault one house after another would involve inordinate loss. As an alternative, a part of the attacking force might gain possession of the roofs of houses and then advance abreast of the troops moving along the street. Patrols should be left at intersecting streets as the troops move forward. The brunt of street fighting will fall on infantry and pioneers, and to some extent on artillery. Cavalry should be used to patrol in rear of the advancing columns and to pursue outside the gates. Artillery would be useful in attacking barricades. Each column should be accompanied by machine guns and equipped with explosives, ladders and ropes.

No hard and fast rules can be formulated to govern formations. A point should be thrown out by each column as a matter of course, but the normal advance guard formation is superfluous. On wide streets, a series of lines is preferable to column of fours. All animals and artillery should be kept well in rear, guns being sent up when required. Machine guns may be near the heads of the attacking columns.

Patrols posted on intersecting streets and on the roofs of houses can maintain communication with each other and with adjacent columns by means of visual signals. A conspicuous building should be designated as central signalling station and all progress reported to it. The commander might well locate his headquarters there likewise.

It would seldom be an advantage to continue operations after dark, though darkness might be utilized to rush some particular locality. Troops should halt before darkness sets in, preferably in a square, and post patrols and outguards on housetops and in streets radiating from the square.

When troops are employed against rioters, the tactics employed will be materially different from those just described. The methods used should be simple and direct. To disperse the mob is at once the quickest and surest method of stopping the riot.

The troops should be marched in close order to the locality where they are needed and should employ either shock or fire action to disperse the rioters. Cavalry, except in very cramped localities, is best suited for this work. Artillery is seldom required, but guns judiciously posted have a great moral effect. In any case, a definite plan and system should be followed.

—In Oriental Cities

[The Tactics of Street Fighting as applied to Eastern Countries. By Major C. L. Norman, M.V.O., Q.V.O., Corps of Guides. *Jour. United Service Inst. of India*, Apr., '15. 7000 words.]

Eastern cities are generally characterized by the absence of open spaces that would enable troops to act with comparative freedom, by the existence of dominating points, narrow, winding streets, strong masonry houses with flat roofs and winding staircases.

The opponents likely to be encountered may be expected to possess little organization, discipline, or determination. They are likely to be very susceptible to bold, resolute action.

Troops are likely to be employed in street fighting against mutineers who have seized a city, against unorganized opponents in case of riots, and in case the troops themselves are attacked by superior numbers and have to hold their own until relieved.

As action in force by the troops is generally impossible for obvious reasons, they should operate in small, compact columns, each sufficiently strong to be self supporting. Each column should consist of a complete unit. Animals are generally out of place with such a column. If there are any open spaces within the city, a few cavalry may have great moral effect. Want of space will, likewise, generally prevent the use of field and heavy artillery, but where room is available, the use of even a single gun may produce a very great effect.

The brunt of street fighting will fall on the infantry. Details of engineers equipped with tools and explosives should be attached. Machine guns and mountain guns are especially valuable. Cavalry, though rarely required with a column, can be used, accompanied by horse artillery, to delay hostile reenforcements and to take up the pursuit of the enemy after he is driven out of the city. The moral effect on the Oriental mind of knowing that retreat is cut off, is very great. Artillery will often be able, by taking up a position outside the city, to assist the columns by delivering a covering fire.

The formation of each column will vary according to circumstances. An advance guard will generally be unnecessary, scouts preceding the column instead. The leading element of a column should be composed exclusively of infantry. Behind this should follow a detachment of engineers with explosives and tools, a support of infantry with machine guns and mountain guns (unless these can be pushed farther ahead), the main body of the infantry, a part of it detailed as reserve, and finally, the transport under small escort which should also protect the rear. Special detachments should be designated to cover side streets. The troops of the entire column should fix bayonets.

An effective system of intercommunication should be provided and the troops launched according to a definite plan outlined in carefully framed orders. A map issued to each column commander showing clearly the operations entrusted to him and to the other leaders, will be of great assistance.

The advance should be systematic and should proceed without pause. Bold, resolute action always produces a great impression. When it becomes impossible to advance along the streets, the troops should work along the roofs of houses, if necessary sapping from house to house. Any position gained should be held and prepared for defense.

Night operations are rarely advisable.

The various columns should cooperate with one another, each taking appropriate measures for security and communication. The pursuit of the enemy should be entrusted to the cavalry and horse artillery outside the city. Aeroplanes will be of great assistance in reconnaissance. Extra ammunition should be issued before the advance begins and replenished during the action by bearers. As ambulances will prove an encumbrance with a column, they should be replaced by litter bearers.

When employed against rioters, elaborate organization of the attacking force is not so necessary. Some risks can be taken. Bold action against mobs will generally bring about prompt results. In such work, cavalry will often be most useful.

The defensive has no real place in street fighting, but may have to be employed in warding off a counter-attack or in holding on until relief arrives.

It should be remembered that with the Oriental nothing succeeds like success. A vigorous offensive not only yields the best results but is usually the safest course to pursue. The purely passive defensive is almost always fatal. Remember Skobeleff's maxim: "Do not forget that in Asia he is the master who seizes the people pitilessly by the throat and imposes on their imagination."

STRETCHERS

—For Trench Use

[Stretchers for Trench Use. *Scien. Amer.*, Apr 17, 1915. 200 words, illus.]

Extensive trench warfare has necessitated the adoption of some modified form of stretcher admitting of passage through the narrow zigzag passages. A stretcher embodying the principle of the steamer chair, allowing a wounded man to be carried in a nearly upright position, has been adopted by the French.

SUBMARINES

[The Effect of Submarines. By a member of the Japanese Navy General Staff. *Heiji Zasshi,* Mar 15, '15. 320 words.]

The present European War is the first in which submarines have been used, and their effectiveness is certainly beyond expectations, especially against a blockade. A fleet can not effect a perfect blockade against them.

In future sea battles, we must first search out and destroy the hostile submarines. We must study the methods of fighting under the sea rather than on it.

[Submarines Versus Surface Craft for Future Navies. By W. O. Horsnaill. *Fortnightly Review,* Oct., '15. 5500 words.]

The question is being asked whether the functions of a modern navy can be carried out by submarine craft. These functions are:

"(1) To fight enemy ships.

(2) To blockade an enemy's coasts.

(3) To capture enemy merchant vessels in all parts of the world.

(4) To chase and destroy enemy commerce-raiders.

(5) To destroy forts on shore.

(6) To assist land forces by shelling an enemy's position within range of the sea.

(7) To obtain information regarding an enemy's naval movements.

(8) To protect the transport of troops and supplies."

These functions might be modified if, for instance, commerce might be carried by submarine vessels or by aircraft. But a consideration of this question shows that this will be impossible or impracticable. Merchant types will remain the same. The other functions may be considered as conducted against submarine naval types.

(The author concludes that it is possible to develop submarine naval types corresponding to the present elements of naval construction —battleships, battle cruisers, destroyers, etc. High surface speed for submarine or submersible type is contingent upon the development of an ***oil turbine.*** Other types, carrying armor and heavy guns, are practicable from the standpoint of design. and they could perform their functions.)

United States

A contract for the construction of one of the new type of seagoing submarines was awarded by Secretary Daniels to the Electric Boat Company of Quincy, Mass., for $1,350,000 (Jan 12). It will have more than 1000 tons displacement, surface speed twenty knots, submerged speed eleven knots, cruising radius more than 1000 miles, and torpedo boat defence guns.

The submarine *L-1*, the largest yet built for the United States navy, was launched at the yard of the Fore River Ship Building Corporation, Quincy, Mass., on Jan 20. She is one of the seven vessels of the same type which have been authorized. The *L-1* registers 450 tons and measures 165 feet over all. If contract stipulations are fulfilled she will develop a speed of 14 knots on the surface and ten knots submerged.

[Tests of New Submarines *Army and Navy Jour.* Oct 2, '15. 500 words.]

Describes the tests of the new United States submarines *M-1* and *H-11*. Both tests were satisfactory. The *M-1* is required to have a surface speed of 14 knots, a submerged speed of 11 knots, and a cruising radius of 3,500 miles. The builders believe that the latter figure will be actually 6,000 miles. Tests of the *H-11* included a new safety device to bring it to the surface in case of accident, and torpedo firing. The results were satisfactory.

—Constructional Defence Against

[Resisting Submarine Attack. *Canadian Military Gazette,* June 22, '15. Reprinted from *United Service Gazette.* 1000 words.]

The submarine has had more success amongst large battleships in the present war than most experts anticipated. Some, indeed, believed with Vice-Admiral Sir Percy Scott, that the submarine was destined to drive the battleship from the sea, but the majority held the other view. Up to the present no Dread-

SUBMARINES—Continued

nought has been sent to the bottom by this agency, so far as officially known. In this connection the distinction between the Dreadnought and the pre-Dreadnought is important. In the Dreadnought type the bottom has been more effectively divided than in the previous construction, and this double bottom and division system has been extended with each successive ship; and though a full test has probably not been made, the protection is undoubtedly very complete.

Notwithstanding this, the case of the *Lusitania* was disquieting, for the underwater construction of the ship was to an extent that of the latest Dreadnoughts. In both the *Lusitania* and the *Titanic* the watertight doors were closed; and since apparently none of the present Dreadnoughts have encountered the latest type of torpedo from a submarine, and none have been subjected to the experience of the *Titanic* with an iceberg, the effect of any of these conditions on the latest ship construction of the navy is still a matter of speculation.

There are two ways of affording complete protection to the bottoms of the vessels from submarine attacks—either to build boats that will destroy the submarine, or cover the bottom of the ship with armor protection sufficient to resist the torpedo. The latter method has long been under discussion. It is estimated that covering the bottom with a sufficient thickness of armor would reduce the speed of the ship by at least two knots under forced draft. Of course, the adoption of such protection by all navies would reduce the speed all around, with no resulting comparative loss.

In order to fit the armor, the design of bottoms would have to be different from the present form, and experts claim that the change of construction would result in a design for a ship smaller and shorter than at present. This would return the size of battleships to more moderate dimensions. These changes would necessitate lighter armor on other parts of the hull, a certain sacrifice of gun-power, and other compromises.

—Motorboat Submarine Destroyers

[Naval Notes of the War. *Army & Navy Jour.*, Nov. 20, '15. Quoted.]

"A contract with the British government for one hundred electric launches, sixty feet long, with a speed of twenty-seven miles an hour, was closed with a firm at Greenport, N. Y., Nov. 13, 1915. The same firm recently completed a contract for twenty-eight launches of a similar type for Great Britain, and these boats now are in service. They are probbaly used as submarine chasers."

["Submarine Chasers" for the British Navy. *Scientific American*, Nov. 13, '15. 300 words. Illust.]

The British Admiralty has created a large fleet of fast motor boats, armed each with a rapid-fire gun. The orders were widely distributed to insure rapid delivery. Forty were built at Lawley's yard, Boston. They are V-bottom launches of 100 h.p. and 25 knots speed; price, $4000 each. The forward deck is strong, and a trunk cabin accommodates two or three men. Special carburetors allow either gasoline or a heavy oil to be used.

—Nets for

[*Information*, June, '15.]

Wire nets have been placed by the British Admiralty in waters where German submarines may lie in wait for ships. They are supposed to have made possible many captures. These nets are much like woven wire fencing, except that their meshes are much coarser. By means of wooden blocks the nets are kept submerged at about the depth submarines are likely to move. When the submarines strike the nets their fins and propellers become entangled in the wire and they are forced to rise to the surface. When a submarine hits a net an electrical connection flashes a signal to some naval base, thus making it possible for naval craft to rush to the disabled submarine before it can disentangle itself.

[A Submarine Catcher. *Scientific American*, July 24, '15. 575 words. Illus.]

Comparatively narrow channels to harbors are usually protected by strong steel cables from shore to shore, but such protection is not suited to larger bodies of water.

A device has been invented by a gentleman in New York City, several hundred of the "catchers" to be dropped overboard from a small cruiser. They cannot be discovered from the conning tower of a submarine.

The device consists of a ring of light gas pipe or iron, 24 feet in diameter suspended freely by a chain to a float, which is nearly submerged. Attached to the ring are eight 3-in. ropes about 100 feet long with looped ends. The ropes are continuous in pairs and the attachment to the ring such that one of each pair will easily break away from the ring and thus permit about 200 feet of rope to wrap around the submarine and catch the propeller blades.

The float is provided with a Coston signal flare arranged to be set off by a pull on a lanyard which runs down the chain to the ring.

—Periscopes

See
PERISCOPES

—Use of in European War

[German Submarines. *Army and Navy Jour.* Oct 16, '15. 500 words.]

Germans deny that they have lost any such number of submarines as has been reported, i.e., sixty-seven up to Sept 23. Such loss deducted from the computed number in commission at the beginning of the war and built since would leave only about fourteen German submarines now available for operations. Activity in the Mediterranean, Dardanelles, Black Sea, and in British waters and off the Norwegian coast now currently reported could not be the result of the work of such a small number of submarines. It is therefore concluded by German officials that the statements of losses are proved to be incorrect.

Information from German sources is that the submarine service is popular notwithstanding its hardships, and that the morale of the crews is of the best. It is thought that submarine operations will be extended in scope rather than circumscribed.

[The War in Europe. *Army and Navy Jour.* Oct 16, '15. 150 words.]

A semi-official despatch from Berlin Oct 9 denies the great losses of German submarines reported, sixty in the aggregate, and states that the losses have been less than a quarter of that number. It is asserted that Germany now has more submarines available than at the beginning of the war.

[The War in Europe. *Army and Navy Jour.* Oct 16, '15. 200 words.]

British submarines have made their way into the Baltic Sea, and have torpedoed a number of German vessels. The *Politiken* of Copenhagen says: "How many British submarines have got through the narrow sound is not known, but it is evident that Germany was too late in laying the Baltic mine fields." Traffic across the Baltic is said to be in a state of disorganization.

[The War in Europe. *Army & Navy Jour.*, Oct. 30, '15. 200 words.]

Quoting from the *United Service Gazette* of London, it appears that the British submarines operating in the Baltic are using Russian bases. This obviates the hazards of entering and leaving the Baltic by narrow channels, and enables the submarines to remain on the cruising grounds for longer periods. It is predicted that greater numbers of submarines will be engaged on this work in the future.

[German Submarines. Note. *Army & Navy Jour.*, Oct. 30, '15. 500 words.]

The failure of German submarines to paralyze British shipping is shown by the fact that during the week ending Oct. 13, 1915, 1500 steamers exceeding 300 tons entered and left British ports. Only four of these—total, 15,500 tons—were destroyed. Of about 6000 British vessels in the carrying trade, 56 had been destroyed by German cruisers and 184 by submarines—a total of about 4 per cent. For some weeks the submarine activity of the Germans has been checked, while British submarines have become active in the Baltic Sea.

The submarine has not proved a failure in war, and with further improvements it will be a still greater menace. But defensive plans have been thought out and tried out, with such success that submarine activity has been largely checked. The great British main fleet continues to dominate the sea. Of this fleet, only sixteen vessels have been sunk by submarines.

SUBSISTENCE

See

COMMISSARY

—Emergency Ration

[Army Emergency Ration. *Army and Navy Register.* Sept 25, '15. 400 words.]

Samples of the new emergency ration have been sent to the Philippines and to Texas for storage in order to test its keeping qualities. As this test under varying conditions of climate must last two or three years, it is clear that the army is destined to be for some time without an emergency ration. The old ration was satisfactory to the army, which does not look with favor on the attempt to provide a substitute for an article approved by medical officers and by all others who had an opportunity to test it practically.

SUMMER INSTRUCTION CAMPS

See

UNITED STATES—MILITARY POLICY OF—STUDENTS' SUMMER INSTRUCTION CAMPS

SUPPLY AND TRANSPORTATION

See also

CAVALRY—SUPPLY AND TRANSPORT FOR
MOBILIZATION
MOTOR TRANSPORT
RAILROADS

Chile

[The Supply Service of the Army in the 1915 Maneuvers. By Roberto Wegmann. *Memo. del Ejército* (Chile), July, '15. 4000 words. To be continued.]

This article gives in considerable detail an account of the organization and operation of the Subsistence Department during the maneuvers in which three small Divisions participated from the 7th to 12th April.

Four depots were established at convenient locations in the maneuver territory and were connected by a field railroad. Supplies were obtained as far as possible by purchase in the vicinity of each depot and were delivered by the field railroad to the division wagon trains, by which they were distributed to the troops.

Rolling kitchens accompanied the troops and were found to be of great benefit. If the troops failed to obtain their regular supply of food at all times, it was not due to the Supply Department, but to the inexperience of their officers, who were not accustomed to the methods employed in this case. In general, officers have too little knowledge of the difficulties of provisioning the troops in war and of the measures employed to accomplish it.

In the solution of tactical problems, staff rides and the war game, the food supply is taken for granted, and its influence on tactical operations is not realized.

In maneuvers, the peace system of supply is usually continued. Nothing is learned of the real conditions attending this problem in war, and operations are sometimes conducted which could not be effected in time of war, due to the impossibility of supplying the troops.

—By Motor

See

MOTOR TRANSPORT

—Dependence of mobility upon

[The Relationship Between Supply and Transport and Mobility. By Maj. T. R. C. Price, 11th K.E.O. Lancers. *Jour. of the United Service Inst. of India.* Jan 1915. 3000 words.]

SUPPLY, ETC.—Continued

To be strongest at the decisive time and place is a fundamental principle of war, but an army must be fed to fulfill this condition.

History is a guide in matters of strategy and tactics, but it is obvious that without mobility and discipline the best strategy and tactics will fail. As mobility and discipline are dependent upon supply and transport, it is important to study examples from military history in which mobility and discipline were affected either favorably or unfavorably by the condition of these services.

After the second Bull Run, the Confederates decided to invade the North, though Lee considered his transport and supply service too poor to attempt it. In the subsequent advance, there was wholesale straggling, the Stonewall brigade being at one time reduced to 300 men on account of it.

In the Seven Weeks' war, the Prussian supply arrangements were excellent. Magazines were provided, and local vehicles were used to collect supplies. Requisitions were resorted to, but the principal reliance was placed upon magazines. The Austrian supply system was so incomplete as to render the army practically immobile.

The Franco-German war proves that when the actual fighting power of two armies is approximately equal, the causes that settle the issue must be sought elsewhere. Napoleon's dicta: "The transport service is essential to the success of an army and often to its preservation," and "The transport service is the soul of an army to which it, of itself, communicates life and movement," were forgotten by the French. At the outbreak of the war, they were short of officers, men, animals, and supplies, in the transport service. Straggling in search of food, robbery, and pillage were the result. The Garde Mobile at Châlons even mutinied because they had no food. Defects in the supply and transport service had much to do with frustrating the original French plan for an offensive movement against Germany. The slowness of Bazaine's retreat from Metz was largely due to the enormous mass of transportation.

The Prussians had paid just as much attention to their supply and transport service as to their mobilization, drill, and training.

The Russo-Japanese war furnishes many examples of the dependence of mobility on supply and transportation. Witness the delays and difficulties of the 1st Army in its advance to the Yalu and again from Feng-huang-cheng to Liaoyang. The retirement of the Japanese 12th Division from Sha-chia-pu to Saimachi, where it remained inactive for ten days, was not made for strategic reasons, but on account of supply and transport difficulties. In the western theater of war, the difficulties encountered by the Japanese supply and transport services resulted in long halts after Telissu and after Tashichiao.

The Russians had the advantage of a railway in their rear, but the moment they left it, they paid the penalty of inadequate supply and transport arrangements.

Coming down to the present, our home forces are engaged in country that has plenty of good roads and railroads. Billeting and living on the country can be resorted to, thereby considerably increasing mobility.

A study of military history leads to the conclusion that an "efficient supply and transport service" and "mobility" are synonymous terms, and that, as Frederick the Great put it, "The act of conquering is lost without the art of subsistence."

—Forage

See

Forage

—Of Cavalry

See

Cavalry—Supply and transport

—Of Horses

See

Horses—Transportation of

—Of Wounded

See

Wounded—Transportation of

—Organization

[The Service of the Army Train; Its Organization in Peace, and Its Formation in Time of War. (Continuation). ***Memorial del Estado Mayor del Ejército de Chile.*** 5000 words.]

In Chile, Argentine, Peru, and Bolivia carts and pack animals are generally used by the civilian population, but for military purposes the native carts are not suitable, since they are mostly of poor quality due to the indigence of the people. A few of the better class use four-wheeled transportation.

Lately the character of the highways has been improved, as is evidenced especially by the increased use of motor vehicles. Conservative people formerly considered the automobile impracticable, but its use has demonstrated its practicability even in rough country.

Military experiments have shown that the transportation in use in Chile is adaptable to all parts of the roughest country, and certain German types have proven entirely satisfactory, even in desert country. The difficulties generally encountered are due to lack of training and experience on the part of the men and animals. Baggage offers the greatest problem.

It will be inconvenient, if not impossible, to use pack transportation exclusively, due to the lack of suitable animals.

Trains must use only the roads, and only occasionally will it be necessary for baggage to follow troops off the highways. The enormous amount of baggage and supplies required by a modern army, and the demands for the comfort of troops point to the impossibility of supply by packs alone. It is calculated that 720 pack animals would be needed for the daily issue of rations and forage to a division of 17000 men and 4000 animals, and, on the same basis, for a reserve supply of 6 days, 4320 mules. Thus, to supply several divisions of a large army, the number becomes prohibitive, for, in addition, the pack mules themselves have to be foraged.

In brief, for five divisions, using pack transportation alone, the ration, forage, and water supply (for water supply must be considered in the desert) would take at a conservative estimate, 34,560 mules, out of a total number in Chile, in 1913, of 46,000; and these enumerated supplies do not take into account baggage, sanitary supplies, and ammunition. Including these latter, we arrive at a result absurdly large.

On the other hand, the necessary number of mules could be utilized for draft purposes, for which they are better suited than horses, and the results would be more satisfactory.

Studies and experiments point to the two-wheeled cart with two mules or horses as the best for Chilean purposes, to carry the bulk of the supplies, leaving pack transportation for mounted artillery and part of the infantry baggage.

This consists of that necessary to supply the troops, exclusive of bridge, siege, telegraph, and aeronautic trains, which belong to the "general train." Trains of the depots and storehouses are under the authorities controlling these places.

To the "general train" belongs also the baggage sections, which, with infantry, should be part on pack animals, to enable it to follow the troops in rough country. The combat and baggage sections are organized by battalions.

The train is under the direct orders of the division commander, and, for peace training, there should be at least one completely organized at all times. The size of the Chilean train has not been determined, depending on the strength of the division in men and animals and the type of wheel transportation to be adopted.

The organization recommended is given in detail, and includes ration, sanitary, and ammunition sections. In time of peace, in addition to the one complete train recommended, certain parts of the skeleton of others should be on hand, and a depot organized for the purpose of supplying all the necessary parts complete.

In peace every detail should be provided for, to avoid later confusion. To-day the service of supply is even more important, if possible, than direct attention to the combatant arms in the matter of training. War makes this felt, and these problems must be solved beforehand.

The principal problems are: determination of the amount of supplies necessary and the type of wheel transportation, including ambulances and other hospital vehicles; determination of the organization of the trains; instruction of the personnel of the trains; administrative experience; solution of the question of passing from a peace to a war footing; and the passage of a law covering the question of requisitions.

SURGERY, Military

[Before and After Lister. By W. W. Keen. Lecture I, "Before Lister." *Science*, June 11, '15. 6000 words.]

(In this lecture delivered before the U. S. Army Medical School, April 27, 1915, the author traces as it were the development of modern surgery and especiallv military surgery. After briefly describing his own experiences on entering the Service as a surgeon in 1861, he takes up the labors and experiences of Ambrose Paré in the middle of the XVI Century.)

At this time gunshot wounds were regarded as "poisoned" and treatment consisted, in part at least, of pouring boiling oil and hot pitch into such wounds. It was Paré himself, in 1536, who discovered that gunshot wounds were *not* poisonous, and abandoned the use of oil and pitch.

He nevertheless advocated cautery for arresting hemorrhage, and it was not until 1552 that he changed his practice and introduced the ligature, a famous advance. The next few centuries saw but moderate progress. Early in the XIX century abdominal wounds and those of the joints were regarded as mortal, and amputation did not heal until 4, 5, or 6 months afterwards. Erysipelas, tetanus, pyemia, etc., were rife. Hospital gangrene was endemic in many if not most hospitals. "Death always stalked grimly after the surgeon." In the Crimea, 40% of cases of major amputation (British), and 67.4% French were fatal—disarticulation at the hip-joint had a mortality record of 100%.

In the Civil War (1861-65) the condition of the hospitals was excellent, that is, general conditions as to shelter, ventilation, cleanliness, good food, etc. But the surgical condition was dreadful: practically every wound suppurated, for bacteriology as yet did not exist, and infection with its possibilities was unknown. Blood poisoning was one of the worst scourges, with a death rate of 97.4%; tetanus had a rate of 89.3%, hip-joint amputation of 83.3%, trephining 61%. The Franco-Prussian War was marked by notable progress in the German Army in respect of sanitation, but tetanus still claimed 91.1 victims out of every 100, major amputations 54+ and 56. In the French armies the results were worse—of typhoid fever there were nearly 75,000 cases in the German armies (1870-71) nearly 58,000 in the British (Boer War); it caused 86.2% of all the deaths in the Spanish-American War. In the Russo-Japanese War, of 173,425 wounded, 11,500 died, 6.7%. The present war has yielded so far very few statistics. The mortality from disease will probably be less than in former wars, but the "military conditions are such that the larger number of artillery wounds, the unavoidable delay in gathering the wounded into hospitals, the apparent absence of any truce for collecting the wounded and burying the dead, and the virulent infection from the soil may result in a large mortality rate, and possibly a larger percentage than in previous wars, in spite of the benefits of listerism. But were the first aid packet and the Listerian treatment not available the mortality ratio in this present horrible war unquestionably would be far greater than that which will be recorded."

[Lecture II. "After Lister." *Science*, June 18, '15. 6500 words.]

Antiseptic rather than aseptic treatment is in favor for the treatment of the wounded in

SURGERY, Military—Continued

the present war, for comparatively few cases reach the hospital uninfected. The condition in the trenches has greatly increased the difficulties of the surgeon. The problem is "*to transform a septic wound into an asceptic wound and keep it so, and at the same time . . . to combat the toxins already diffused throughout the body, but without doing harm to the patient himself.*"

Typhoid has been practically conquered in this war. In the British Army there have been only 606 cases in all, 247 partly and fully inoculated, with 2 deaths (0.81%) and 359 not inoculated with 4.8 deaths (7.47%) over nine times as many deaths proportionately. These results are due to the use of antityphoid inoculation. Voluntary in the British army.

To sum up: Lister and Pasteur inaugurated a *new era* in surgery: then came the germ theory and antiseptic surgery, accompanied by the birth of a new science, bacteriology. In war Lister's work has been a boon beyond price.

[Note. *Army and Navy Jour.* Oct 23, '15. 200 words.]

Up-to-date war surgery was demonstrated before the New York Surgical Society by Drs. Martin and Lyle, recently returned from France. The difficulty of guarding against infection of wounds is great. Powerful magnets are used to find bullets and fragments of shrapnel and shell. A new method of locating such foreign objects is of American origin by Dutton. Two X-ray photographs, taken at different angles, give by intersection the location of the bullet or fragment. Such bodies pressing against nerves frequently give symptoms resembling tetanus.

See also

X-RAY TECHNIQUE
WOUNDS

—In European War

[Experiences in Military Surgery. From address of W. E. Drennan, M.D., before American Medical Association. *Army and Navy Jour.* Oct 16, '15. 1000 words.]

Recounts experience in American Ambulance Hospital at Paris in latter part of 1914 and early part of 1915. Saw no men with bayonet wounds, but heard reports from soldiers of men killed by bayonet. 436 wounds on 260 men showed 335 by artillery fire and 99 by bullets. [Trench fighting?—ED.]

The sharp pointed bullet is remarkable for its severe wounds, the exit being large and ugly. Wounds are classified as explosive (0-500 yds.), penetrating (500-1000 yds.), simple wounding (1000-2000 yds.), and contusing (2000-2500 yds.).

95% of wounds suppurated. The best treatment is free drainage. Tetanus has become a negligible factor through generous use of antitoxins. No effective treatment for gas gangrene has been found.

(NOTE.—In this and other discussions of proportion and character of wounds from various causes, it is well to remember not only the character of the operations, but also, as in the present article, that at any place away from the immediate vicinity of the firing line, the wounded have already gone through a sorting process. ED.)

SURPRISE

[Surprise in War. By F. M. *Riv. Mil. Italiana,* May-June, '15. 14,000 words.]

Surprise in war has great moral influence and also great material effect by robbing the enemy of time and space for efficient action. Surprise does not consist merely in falling upon the enemy unexpectedly; it may be political, in forming alliances and securing aid; or it may take the form of adopting new weapons, preparing forts, railroads and roads, or giving new training to men. Hannibal made use of surprise by taking advantage of the political disaffection of the cisalpine peoples. The operations of Garibaldi were full of this element. The state of preparedness of the Prussians in 1870 was a surprise to France. Italy was taken by surprise at the unexpected hostility of the Arabs in the recent war in Libya.

In the war of 1859, the alliance between Sardinia and France surprised the Austrians. The same effect resulted from the alliance of France and Italy in 1866. Another similar case was the union of the Balkan states in the recent war against Turkey.

Japan gave an example of surprise in war preparations by the quiet development of a large and powerful modern army. Other examples are the action of Scharnhorst in Prussia in developing large masses of reserves by a short period of service; the display of unknown numerical strength and fighting qualities by the Turks in 1877-8; a similar display by the Boers against the English; and Wellington's lines of Torres Vedras. The development of new means of warfare has been constant, from the introduction of elephants by Pyrrhus to the use of high explosives in recent wars.

Classical examples of surprise in strategical movements and on the battlefield are found in the wars of Napoleon. In 1805 his army reached the banks of the Main and the Rhine, while all Europe thought it was still on the shore of the ocean. He accomplished repeated surprises of this kind by spreading false news, by rapid marching, and by himself remaining in Paris till within three days of the crossing of the frontier. All this is impossible to-day because of the development of rapid communication. But even as late as the Russo-Japanese war, Japan, by destroying at one stroke the superiority of the Russian fleet, was able to land troops in Manchuria and fight the first battle on terms of superiority over Russia that no one in Europe or America would have believed possible a few weeks before.

History shows the offensive to be preferable to the defensive, but the success of the offensive depends upon either a large preponderance of strength or the use of surprise. The willingness to attempt what seems impossible is one of the great elements of success. Note Napoleon's action at Arcola, with 15,000 men attacking a force of 30,000 over marshy ground; also his crossing of the Alps. In the Russo-Turkish war, Gen. Gurko took a corps

across the Balkans by a route considered so impracticable that it was left unguarded. The Japanese victory at the Yalu River resulted from turning the Russian left by a movement over a mountainous zone defended by only a few Cossack posts.

The success of a turning movement requires great activity, in addition to concealment. In the campaign of 1859, Napoleon III. planned to turn the Austrian left and to reach the Ticino before the enemy could. The first part of the plan was successful, but the second part failed, because it was executed too slowly. In 1870 the battle of Vionville-Mars-la-Tour was opened by a bombardment of the camps of the French, who did not know that the Germans had reached the French right flank. This surprise contributed much to the failure of the French to win the battle, although numerically the stronger, thereby allowing the Germans to block the French line of retreat and leading to Bazaine's withdrawal into Metz.

In the last days of January, 1905, Kuropatkin planned to make a demonstration against the front of the Japanese position, a heavy attack on their left wing, and a cavalry attack on their rear. The attacks failed, because the small Japanese units guarding the flank and rear made such an obstinate resistance and so delayed the Russians that reinforcements reached the threatened points. In the last great battle of this war the Japanese endeavored to envelop the Russian right wing near Mukden, and while the result was a victory for the Japanese, the battle was so prolonged that the Russians had time to recognize the real attack and collect troops to oppose it, thus saving their army from the destruction planned by the Japanese.

A notable example of surprise on the defensive is found in the campaign of 1814 when Napoleon was retreating on Paris before the allied armies. He fell upon one of the allied columns that was marching in three parts, attacking one fraction after another, and with 30,000 men put to complete rout a force more than double in size, capturing considerable artillery and several thousand prisoners. Formerly, a favorite method of defense consisted in operating on interior lines, but it is difficult now to achieve the surprise that is so large an element of success in such an operation. Another defensive method is to give way before the attack of the enemy and when he attempts to press his advantage to assail him with strong reserves.

At the battle of the Sha-ho in Oct., 1904, the Russians took the offensive with the intention of turning the Japanese right. While the turning force of three corps under Stackelberg was making the movement, Gen. Shimamura took advantage of a thick fog and led 500 picked Japanese in an assault upon the Russians, and caused a pause in the movement. After its resumption, two days later, a Japanese cavalry brigade with three Hotchkiss rapid-fire guns climbed a precipitous height and opened an unexpected fire on the Russians, forcing them to withdraw. On the same day on the opposite wing the Japanese made an attack with two battalions that moved over difficult ground under cover and surprised the enemy. After these attacks the Russians abandoned all idea of the offensive and withdrew along the entire front, and the next day the Japanese took the offensive.

Sometimes the opportunity for surprise comes unexpectedly, and success depends upon the promptness with which advantage is taken. On the other hand, the force surprised may be saved by rapid reinforcement and by taking advantage of the failure of the enemy to follow up his initial success. In 1815, Wellington, thinking Napoleon had not taken the offensive, was at the ball of the Duchess of Richmond while the French were at Quatre-Bras, 35 km. from Brussels. But the Anglo-Dutch subordinate commanders marched and fought, although in violation of their orders. Two days later at Waterloo, Napoleon was guided by his preconception that the Prussians would not take part in the battle. It was their arrival on his right flank that produced the catastrophe.

Other methods of surprise are in the nature of stratagems or artifices for deceiving the enemy. Garibaldi showed himself a master of this art, by feints, by marching ostentatiously in daytime and doubling back at night, by moving over difficult and little-known trails, and by various expedients that enabled him to win battles with his small force.

It is of the highest importance, both in achieving surprise and in avoiding it, that the service of exploration, security, and communication shall receive strict attention.

As a final word, it is necessary to say that surprise must not be regarded as a necessary or sufficient condition of victory. It is only a factor that may often enter, but many other factors are essential.

[NOTE.—This article was written before the outbreak of the present war, but the principles set forth have been confirmed by the struggle in progress. Elements of surprise are found in the political developments, the resistance of Belgium, the entry of England, the attitude of Italy; in the immense power of Germany, her submarines, her 42 cm. mortars, her asphyxiating gases; and in the barrenness of results after so much fighting.]

See also
ADVANCE GUARD

SURVEYING

See also
SKETCHING

SWEDEN

—Army—Organization

[The Swedish Army. By Capt. Tonelli di Fano. *Riv. Mil. Italiana*, June, '15. 3000 words. 1 table of fortress, siege and coast guns, 1 table of ammunition for same, and 1 table of army organization.]

The Swedish army consists of three parts: 1st line, the active army; 2d line, the reserve; 3d line, the landsturm or national militia.

Personal military service is compulsory, from the age of 20 to 31 in the active army, from 31 to 35 in the reserve, and from 35 to 42 in the landsturm.

SWEDEN—Continued

Service with the colors is as follows: for infantry, 250 days in the 1st year, 30 each in the 2d, 3d and 4th, and 15 in the 9th; total, 355 days; for cavalry, field artillery, field and signal engineers, 281 days in the 1st year, 45 each in the 2d, 3d, and one period of 25 days in the 5th or 6th year; total, 396 days; for fortress engineers, 295 days in the 1st year, 35 each in the 3d and 4th, and 15 in the 9th; total, 380 days; for the transportation troops, 150 days in the 1st year, 30 days each in the 2d, 3d and 4th, and 15 in the 9th; total, 255 days.

The total effective force that can be raised is 670,000 men.

The army is organized into six divisions. Infantry regiments have three battalions of four companies each. The infantry is armed with the Mauser magazine rifle, model 1896. Some cavalry regiments consist of 5 squadrons each, others of 10 each. Cavalry is armed with straight saber, model 1883, and repeating carbine, model 1894. Both rifle and carbine are of 6.5 mm. caliber and carry five cartridges.

Light field artillery is armed with the Krupp 75mm. gun and 10 cm. mortar. Heavy field artillery has gun and mortar of 12 cm. caliber.

Fortress and siege guns are from 5.7 to 15.5 cm. caliber, and coast guns from 5.7 to 24 cm.

Engineer troops are divided into field, fortress, telegraph, balloon, aviator, photograph, and radio units. The train troops are divided into transportation and sanitary units.

The army in war is commanded by the sovereign or by a general officer whom he selects. A field army consists of a number of divisions, each division having 2 brigades of infantry, 1 regiment of cavalry, 1 regiment of artillery, and auxiliary troops.

A large part of the army in war is required for the garrisons of coast fortresses, including their land defense.

There are about 2500 shooting clubs, with a membership of 180,000, from which it is estimated that 120,000 "volunteer riflemen" can be organized in case of war.

SWITZERLAND

See also

ARMY—ORGANIZATION—SWISS-AUSTRALIAN SYSTEM

EUROPEAN WAR—COST—SWITZERLAND

—Army—Artillery

See

FIELD ARTILLERY—INSTRUCTION AND TRAINING—SWITZERLAND

—Army—Organization

[The Swiss Military System. By F. Feyler. *Century*, Nov, '15. 6000 words. Illustrated.]

(Note.—The following editorial note accompanies the original article:—"Colonel F. Feyler, author of 'La Suisse sous les armes,' is generally accepted as the leading authority on Swiss military affairs." The article is here given in full abstract on account of its value as a clear statement of the Swiss system, so frequently mentioned in connection with our own military requirements.—Ed.)

The Swiss military system is adapted to Swiss needs, and it employs the diverse aptitudes of the men and the material resources of the people. The fundamental principle of the system is that every one under the jurisdiction of the state owes it military service. Every citizen has accepted this principle, and views it as a right to serve his country. Only those physically unfit, or deprived of the right to be soldiers by penal servitude or bankruptcy, can be excluded from the army, and even they pay a special military tax if financially able to do so. Cases of refusal to serve are rare. The call upon the time of the private soldier is small, but this call increases rapidly with the grades. Switzerland is a nation of soldiers who ordinarily wear citizen's dress.

Recruiting. Recruiting is regulated by a law of 1907, fixing the period of military service from the age of twenty to forty-eight, extended to the age of fifty-two in the case of officers.

There are three classes of service in the army,—the élite from 20 to 32, the landwehr from 33 to 40, and the landsturm from 41 to 48. Normally, the élite constitutes the field army, the landwehr the force for operations requiring less physical vigor, such as garrisons and trench fighting, and the landsturm furnishes troops for lines of communications and internal police duty. Any men not otherwise accepted as recruits may join the landsturm on proof of markmanship.

Thus organized, the army is kept as nearly intact as possible. Thus the supply service is maintained by using those recruits originally not up to the minimum physical standard, supplemented by those who later develop physical defects not fully disqualifying.

On this basis, recruiting calls to the colors 68 per cent to 70 per cent of the young men of the nation, and yields a drilling army of 250,000 to 260,000 first line troops and 80,000 to 90,000 territorials,—a total of 10 per cent of the population not counting those under 20 years of age. Those not recruited are given special training in any duty for which they are fitted, such as drivers, clerks, etc.

Instruction. Swiss soldiers must be prepared to fight against trained soldiers, therefore no half-way instruction will suffice. Thorough instruction is sought by (1) teaching the rudiments of military instruction in the schools; (2) intensive training in the short period of recruit instruction; (3) maintaining and improving the military training by exercises and maneuvers in the years following the recruit instruction; and (4) requiring practice in technical exercises during the whole period of military obligation.

Preparatory Instruction. Uniform obligatory gymnastic instruction is given in all primary and secondary schools, governed by a manual and systematized by central courses for teachers and gymnastic instructors. Certain secondary schools have cadet corps and give rudimentary military instruction, including rifle practice. This is neither obligatory nor general, being practiced only in 13 of the 22 cantons. From 17 to 19, certain optional courses of military instruction, including gym-

nastics and rifle shooting, are available. From among those taking this optional instruction comes a notable proportion of the non-commissioned officers. Even at home, the future recruit may take up gymnastics and rifle shooting under competent instruction.

The School for Recruits. At twenty, the recruits are called to the colors. Nearly all of them are partly prepared for their duty by the gymnasium, and many are familiar with the rifle and target practice. The recruit has for a long time been required to pass a mental examination, and lately a gymnastic examination has been added, comprising an 80-meter sprint, the long jump, and 17 kg. dumbbells. The latter examinations serve to stimulate gymnastic instruction. "The duration of service varies according to the branch of the army. It is for 67 days in the infantry and for the engineers; 92 days in the cavalry; 77 days in the artillery and garrisons of fortresses, and 62 days in the sanitary corps, the quartermaster's department, and the department of transportation." The aim of the school for recruits is to inculcate in the infantry sound military instruction and produce a soldier ready to obey orders and co-operate with his comrades. In the other branches, the same principle is followed, and the recruit is in addition instructed in the special work of his own branch.

The school for recruits furnishes an opportunity for selecting and training non-commissioned officers, subalterns and captains, and for developing commanders in the instruction and handling of soldiers. This work is carried on under the supervision of guides and instructors, who with the corps and division commanders, constitute the only permanent officers of the Swiss army. They number less than two hundred all told, but they receive a thorough theoretical education and have wide experience in instruction so that they become authorities in the intensive instruction of recruits.

The Repeated Courses. After the recruit instruction, the instruction in each branch of the service is continued by exercises and maneuvers called repeated courses, which are held each year for a period of two weeks. Soldiers and corporals are called for the repeated courses up to the age of 27 in the élite and once again in the landwehr; non-commissioned officers and subalterns are called every year up to 32 in the élite, and every four years in the landwehr up to 45; the superior officers in the élite are called every year to the close of their service. In the repeated courses the work alternates yearly between small and large units. One year is given to detail and the next to the movement of large bodies of troops. Thus the entire Swiss army is mobilized for two weeks each year. Recruit instruction is given in barracks; the repeated courses are varied in locality and simulate the conditions of war.

The Instruction of Officers. The value of an army depends upon its officers. With short periods of instruction more is required of officers. A Swiss adage says that one must pay for his officer's stripes. Every promotion is preceded by a period of probation. The first selection is made in the school for recruits, where good material is noted and their social position inquired into, so that no undue sacrifice may be required. No one has the right to refuse an advance in grade. [Promotion means increased time devoted to military service.—Ed.] Conduct in civil life is inquired into, and if satisfactory, the selected recruits are sent to a school for non-commissioned officers, and emerge with the grade of corporal. This rank leads to a second selection as instructors in the recruit school, and those considered fitted for officers are sent to a school for officers, where for three months they are prepared in the grade of lieutenant. There are plenty of men anxious for this grade notwithstanding the additional time required. If they pass the examination, they attend the repeated course as chief of division with the rank of lieutenant.

The length of service in the first year is 67 days in the recruit school and 13 days in the repeated course, a total of 80 days; if he becomes a corporal, he goes to the school for n. c. o.'s 22 days, and again attends the recruit school in his new capacity 67 days, a total for the corporal of 169 days; to be promoted lieutenant, he attends the officers' school 82 days, and again the school for recruits for 67 days, a total of 318 days service.

To reach the grade of captain, the lieutenant must go through at least eight repeated courses in various capacities, a school for firing and the central school, bringing his total service to 541 days with new requirements upon his time, for he will have to take two courses in tactics and attend the repeated courses until 35.

The pay of a lieutenant is $1.20 per day; of a captain, $2.00; and of a major $3.60. With the interruptions to a civil pursuit incident to frequent calls to the colors, it is seen that the officer is called upon to display patriotism and self-denial.

Instruction Outside the Service. Under the law, numerous courses of study are carried out by associations with the design of supplementing the military training, keeping alive intellectual and technical training. The society of officers and n. c. o.'s is charged with the preparatory military instruction in schools.

One phase of this instruction is rifle practice, which is semi-official in character. The groundwork of the plan is a legal obligation resting on every soldier who carries a gun to fire approximately 100 rounds at a target in every year of his whole military life. This target shooting is supervised by delegated officers. If the rifleman reaches the required standard of markmanship, slightly more than the cost of his ammunition is refunded to his rifle society by the government. If he fails to qualify, he has to take a special 3-day course in target practice at his own expense. Thus target shooting is constantly going on

SWITZERLAND—Continued

all over Switzerland, particularly on Sundays, and it is a feature of nearly all public gatherings.

Mobilization of the Army. The Swiss army is in reality never on a peace footing. Every period of exercise and maneuver constitutes a mobilization equal to that of war. Every militiaman keeps in his own home his uniform, arms, and equipment. Every year this is inspected and anything which has not been well cared for must be replaced at his own expense. At the first call, the militiaman comes forth uniformed and equipped and only needs to draw certain articles, like sapper's tools, etc., from the regimental depot, to be ready for service. The cavalryman brings his own horse. The troops are thus assembled and equipped in a minimum time. Details of requisitions for horses for the artillery and for horses and vehicles for the transport service are worked out in time of peace. A regiment is ready in 48 hours to march to join its division at the appointed rendezvous. In 1914, the whole army,—élite, landwehr, and landsturm,—was mobilized simultaneously, and the arrangements worked well. Although the operations were rapid, there were some delays, and if Switzerland had been confronted by the conditions Belgium met, the mobilization would not have opposed a sufficient force on the frontier in 48 hours to resist the advance of a cavalry corps charged with the destruction of the railroads.

The system requires certain improvements in detail, but the general principle is correct.

—Military Topography of

[A Review of the Swiss Topographical Exhibit at Bern in 1914. By Prof. F. Becker, Col. of Engineers. *Schweizerische Zeitschrift*, Apr., May, and June, '15. 6000 words.]

(A series of articles describing topographical development in Switzerland, of interest only to those familiar with the subject and the locality.)

SWORD

See also

Cavalry—Arms—Saber

TACTICS

[Maneuvering, Past and Present. By Col. Juan Avilés, Spanish Engineers. *La Guerra Europea*, Barcelona, July 9, 1915. 1800 words.]

Many people, versed in military history, lament that, in this war, there are none of those brilliant maneuvers that led Napoleon so many times to triumph.

The study of military history does no more than increase the erudition of the student, unless that student penetrates its philosophy. Thus only is it possible to deduce a useful knowledge of military art.

In contemplating the maneuvers of Alexander, we are astonished at their childish candor. How did he dare to weaken his front and move troops to the flanks? It is necessary to understand the weight and immobility of the armies of those times in order to comprehend that the Persians were bound to succumb. Any dislocation of their troops to parry the blows of Alexander would have brought with it disorder and dispersion.

As the range of arms increased and formations and evolutions became more elastic, maneuvering became more practicable. But Frederick the Great of Prussia maneuvered, with his famous oblique order, almost under the cannon of the enemy and, from that point of view, hardly separated strategy from tactics.

To Napoleon belongs the glory of extracting the essence of military art from the experience of 20 centuries. But, if his principles apply to all times, not so his methods. To-day Napoleon himself would operate differently.

The maneuvering of the present is less brilliant and more slow in its preliminary phases. The envelopment takes place at many kilometers distant from the enemy and, when the disaster is tangible, there is already no remedy for it.

Neither these maneuvers nor those of Napoleon ever terminate without frontal combats, because the attacked has to turn against the attacker, even if it be only in order to escape. Strategy does not decide a war without the aid of the shock, of the battle. But the maneuver, when it is well conceived and developed, hurls the principal masses against the weakest of the enemy or against vulnerable points and accomplishes victory with a minimum of losses and a maximum of gain.

See also

Advance guard
Engineers—Field operations
Engineers—Organization
Fortifications—Field—Tactics
Guerilla warfare
Initiative
Mobilization
Mountain warfare
Rear guard
Situation (Military)
Strategy
Surprise
Street Fighting
Winter campaigning

—Aeronautics

See

Aeronautics—Tactics

—Artillery

See Artillery *subheads*

Field Artillery—Tactics
Machine gun—Tactics

—Cavalry

See

Cavalry—Organization—United States

—Combined arms—Army and navy

[Forts vs. Battleships. *Scien. Amer.* Apr. 10, 1915. 200 words.]

Casualties among vessels of the attacking fleet have caused a lull in the operations against the defenses of the Dardanelles, less talk about crushing fortifications by gunfire and more about attack from the land side.

See also

Landing operations

—Defense by flooding
See
HOLLAND—MILITARY DEFENSE OF

—Entrenchments
See
ENTRENCHMENTS—TACTICS

—Field Service—Attack

[Frontal Attack and Tactical Training. By Maj. S. Scipioni, Italian Artillery. *Rivista di Artiglieria e Genio*, Apr '15. 3500 words.]

A circular on this subject has just been issued by the Italian General Staff.

Part I states and applies certain principles underlying all military action. In the form of attack under consideration, deployment should be made on a broad front, beyond artillery range, under protection of the advance guard. The march of approach should be as rapid as practicable. The attack should be by rushes, ending in an assault.

Information cannot usually be complete until after the attack has begun. Use of cover is necessary throughout; in the case of artillery, the attack has the advantage that its guns can remain concealed, while those of the defense may have to expose themselves during the assault. Tactical connection of the arms is absolutely indispensable.

Victory is gained by demoralizing the enemy; the essentials for this are movement to the front and superiority of fire. Care should be taken in distribution and formation of troops, so as to get maximum results with minimum numbers. Action once begun should be carried through resolutely.

Modern arms give advantages to the offense, in that they favor use of cover, concentration of fire, and co-operation of arms. Hence we may conclude that the offensive, and even frontal attack, are still practicable.

Part II deals with the use of ground; it points out that the method of advance is determined by the ground, which must be studied to select the proper line.

Part III treats of methods of instruction. Since in war troops usually act in large bodies, all instruction should take this into account. The distinction should always be made between the general tactical idea and the means of execution—the former is the province of the superior, the latter of the subordinate. Exercises with cadres are valuable, and should be frequently held.

Regimental commanders are required to give effect to the principles laid down in the circular, and especially to emphasize tactical connection of the arms. Lectures by officers of other arms are desirable. It is pointed out that field exercises must not be hurried, but plenty of time allowed.

See also
ATTACK

—Field Service—Position of Commanding Officer

[Historical and Tactical Analysis of No. 277, Infantry Drill Regulations. *Revista Militar, Argentine Republic*, Apr, '15. 3800 words.]

"If, on the march forward, contact with the enemy is expected, the post of the chief is as far forward as possible; as a principle, with the leading fractions of the advance guard."

When he is far ahead, he is able to see and has time to reflect on the situation while his troops are coming up.

Of course, he must not expose himself to capture; so, when the situation is undeveloped, it would probably be best for him to march with the principal body of the advance guard. When a combat is imminent and there is not much danger of surprise, he may go forward as far as the cavalry of his advance guard.

"The chief advances from point to point, taking care that the successive elements reach him quickly. From commanding positions, he observes dismounted with a field-glass."

"Thus he is in a position to take confidently the first dispositions and to secure advantages over the enemy by means of opportune decisions; he saves his own troops from useless counter-marches and avoids mistakes on the part of his subordinates."

(Here the author cites historical examples in support of the provisions of this last paragraph.)

—Instruction in
See EDUCATION—TACTICAL MODELS

—Instruction and Training

[Historical and Tactical Analysis of No. 283, Infantry Drill Regulations. By "Infante." *Rev. Militar.* (Argentine), June, '15. 2000 words.]

"The attention of all commanding officers is directed to preserving order, cohesion and co-operation." (Numerous instances supporting the principle above enunciated are cited from modern wars, in which bodies of troops operating without proper control have been overcome by greatly inferior numbers and where initial successes, lacking timely support by available reserves, have been turned into defeat and disaster.

"Subordinate commanders should make every effort, once their mission is fulfilled, to rejoin their proper organizations, and if this be not possible for the moment, should place themselves and their troops at the disposition of the nearest higher command."

This principle applies with equal force to individual soldiers as to bodies of troops. The general situation should always be kept in mind, and a detached command rejoining during a combat should give assistance where it appears most urgently needed or where its action would aid most in securing the common purpose.

(Several hypothetical situations are given and suitable action in each case suggested.)

—Instruction and Training—Tactical Problems

[Solution of Tactical Problems. By Capt. Carlos Sáez, Chilean Army. *Memo. del Ejército* (Chile), July, '15. 5000 words.]

The war game, which calls for prompt decisions and orders based on assumed situations should be preceded by the study of tactical problems for the solution of which ample time is allowed and the use of reference books permitted. After representing the situation

TACTICS—Continued

on the map, the problem should be carefully reviewed to make sure that all its details have been grasped. Many factors must be taken into account in framing our decisions but the most important by far is the *mission* assigned to the command and the sole purpose of the estimate should be to determine how best to accomplish it. Where the character of the action required—offensive or defensive—is not clearly indicated, this should be determined primarily by the *spirit* of the orders received and the nature of the duty to be fulfilled. Once we have fixed our ideas on this point we should proceed to a study of the enemy and of the terrain to see how these may favor or oppose the execution of our mission.

We should endeavor to estimate the situation from the enemy's point of view, not however, with any thought of subordinating our actions to his, but that we may be prepared for all possible moves on his part.

The terrain should be carefully studied. The roads, which determine the direction of our movements and the enemy's approach, are of primary importance—other features are of greater or less importance depending upon the nature of the action we propose to take. The whole art here lies in utilizing to the fullest extent the advantages which the terrain may present.

Having carefully considered all phases of the situation in the sequence indicated, we should now be able to decide what are the most suitable measures and to formulate our plans in detail.

In time of war it will often be necessary to make momentous decisions after only a few seconds of consideration. The faculty of grasping a situation in a flash when subjected to the demoralizing influences of battle is a special gift which has distinguished the great commanders of all times, but this quality may be acquired to a degree by patient study and hard work. In the solution of tactical problems we must accustom ourselves to follow out in all its consequences each of our decisions and in time we will acquire the faculty of prompt judgment and of making a decision in harmony with the situation. The decision should always be the logical consequence of the estimate—a correct decision which does not accord with the estimate is of less merit than an incorrect one which results logically from mistaken judgment.

Finally, our plans should be characterized by simplicity—in war only the simplest measures promise satisfactory results.

The order.

The order should be a clear reflection of the intentions of the commander and should be technically correct in form. It should be clear, precise, brief but complete. Vague and uncertain words and phrases must be avoided and not an unnecessary word employed. The order is complete when it contains all the points and instructions necessary for its correct and certain fulfillment.

—Offensive vs. Defensive

[Current Topics—French. By an occasional correspondent. *Revue Militaire Suisse,* May, '15. 1500 words.]

[This article is in the nature of a review of a recent book, *"La Guerre Actuelle,"* by "Col. Hubert, of Payerne" (Fischbacher, Paris). The book discusses the strategical and tactical features of the first eight months of the present European war. The article consists largely of a general discussion of offensive and defensive rôles, connected by citations from the work of Col. Hubert and the writings of Foch, Bernhardi and other recognized authorities. Some of the principal points made are indicated below.]

The resistance offered by the Boers in the South African war tended toward the view that the defensive was the more advantageous rôle. The incidents of the Russo-Japanese war caused military opinion to veer to the opposite view, and brought out many publications in which the necessity of an offensive rôle was emphasized. Gen. Foch (*Principes de la Guerre,* 1911) argued that the improvements in modern firearms had relatively increased the strength of the offensive. Thus, assuming a numerical superiority in the attacking force, it is obvious that the relative advantage of that force, measured in terms of the total number of shots that can be fired by a body of troops in action, will increase with the rapidity of fire of the rifle used. On the other hand, it must be borne in mind that the improvement in firearms permits much more latitude than formerly to the defense in the selection of positions to be held. With rifles whose rapidity of fire has been increased tenfold, an attacking column can now be checked in an advance over a glacis 100 yards deep as effectively as could formerly be done in an advance over a glacis with a depth of 1000 yards. Hence, less clearing and preparing of a field of fire, and fewer points from which fire need be delivered, are essential for effective defense. One hundred miles of battle front can be properly protected by field fortifications as easily and quickly as 10 miles could once be so covered. So strong, in fact, has the defense become that we find to-day in intrenched lines salients which, without special natural strength or fortifications of a permanent type, are yet able to hold out against every effort of the attacking side; witness the "wart" at Dixmude, the "mound" at Arras, St. Mihiel, La Bassée, etc. In spite, however, of the influences that aid the defense, the offensive rôle must continue to be the dominating one, since it alone gives decisive results. Considering the present war, we find the Germans, in both the eastern and western theaters of war, suddenly overwhelming their less thoroughly prepared opponents, overrunning the territory of the latter and then, when checked, successfully defying all efforts to drive them out. As a result, they have derived not only immense material advantages in property, supplies, etc., but also a moral prestige which has secured them the neutrality of some countries, the secret support of others, and the open alliance of foolish Turkey. Their one mistake has been to unnecessarily prolong

the tactical offensive, instead of sooner supporting their strategical offensive by a tactically defensive attitude.

Due to the development of defensive works, etc., the two belligerents have arrived now at a condition where neither can advance further. In seeking the measures by means of which the Allies may succeed in driving the Germans out of France and Belgium, Col. Payerne believes that the first essential is less centralization of command. This centralization should be less in immobile operations of the present type than in those involving more movement. Where such lengths of intrenched lines face each other, the central control should be generally limited to furnishing information and very general instructions. Each commander of from 80,000 to 100,000 men should be left the greatest possible initiative, so as to be able to take advantage of any opportunity that might present itself on his front. No such elasticity of instructions has prevailed heretofore, the general headquarters having attempted very detailed control and supervision of all combats of importance. On the other hand, each commander of a combat sector should be freed as far as practicable from the weight of administrative details connected with supply, and from the handicap incident to mixing in the same units men capable of great exertion and those able to stand only mediocre strain.

The defensive rôle presents unquestioned tactical advantages where its assumption does not involve sacrifice of strategical or other important ends in view. There are times when it is necessary to utilize it, and its use should be strictly limited to those occasions. Such occasions will usually, except in case of hopeless general weakness, be found to be merely *local* in character. The deliberate assumption of a defensive rôle as a general principle of action cannot be justified where any other course is practicable and must usually spell defeat.

—Tactical Units

See also subhead
TACTICS *under* COMPANY

—Use of Cover

[Talks by the "Old Man." *National Guard Mag.*, Oct., '15. 200 words.]

The use of weeds, vines, or bushes on the uniform for concealment should be limited to those men whose duties require them to remain stationary, such as observers and sharpshooters. Recent experiment showed that men so decorated were more easily seen while in motion than men without such concealment who used the ground to full advantage.

TARGET PRACTICE

—Coast Artillery

See
COAST ARTILLERY—TARGET PRACTICE

—Infantry

See
INFANTRY—FIRE—INSTRUCTION AND TRAINING—MUSKETRY

TELEGRAPHY

See also
WIRELESS TELEGRAPHY

TELESCOPE

See also
FIELD ARTILLERY—FIRE CONTROL—INSTRUMENTS
PERISCOPES
RANGE-FINDING

TENTS

—Field Kitchen

[A Company Field Kitchen Tent. By Lieut. R. H. Kelley, 4th Inf. *Infantry Jour.*, May, June, '15. 1400 words. Diag.]

Inasmuch as the Organization Tables 1914 make no provision for the storage of provisions between daily issues to organizations, the following shelter is suggested: A similar tent gave great satisfaction in recent camps. The motive idea of the tent is that based upon the maxim "An army marches on its belly." The efficiency of a company is in direct ratio to the quality and preparation of its ration. Fair weather can not always be counted upon and the space on the wagon taken by this tent is negligible. The tent is 8 ft. square by 6 ft. high surmounted by a pyramid 4 ft. high. There is no door, but the walls fasten at corners so any or all can be opened up, making a large entrance for men carrying heavy loads. The centerpole is 10 ft. in height—is carried on side of wagon with the extra wagon tongue. Each wall has a 9 in. overlap—and being separate can be used in any desired combination to secure shelter from rain, varying winds, etc. The apex and hood are similar to the same feature of a pyramidal tent, from which an experimental kitchen tent can be readily constructed.

—Hospital

See
HOSPITALS—FIELD TENT

—Infantry Shelter

United States

[Infantry Shelter Tent. *Army & Navy Register.* May 8, 1915. 300 words.]

It has also been known that the infantry shelter tent was too small for comfort, and that contact with it in time of rain caused leakage. This defect could have been cured by the use of impervious material, but none has been made. Hence the decision of the Secretary of War to discontinue the smaller tent, and to issue the larger cavalry tent instead. Infantry officers insist that the adoption of the larger tent is a grave mistake, involving, for example, the loss of a day's ration; its greater weight, moreover, is not offset by its supposed comfort and additional protection.

—Pitching and Striking of

[Pitching Army Tentage. By Maj. W. W. Reno, Medical Corps. *Infantry Jour.*, May-June, '15. 950 words.]

(A suggestion and the detailed operations for reducing the pitching and striking of tents to one easily understood method, instead of the many now found in our regulations. It

TENTS—Continued

has been found satisfactory upon trial. The article is not susceptible of condensation by reason of its technical nature.)

TETRALITE

See

EXPLOSIVES—TETRANITROMETHYLANILINE

TETRONITROANILINE

See

EXPLOSIVES—TETRONITROANILINE

THERMOMETER

—Conversion of Units of

[Thermiometers—A Little Study for the Army Officer's Note Book. By Juan S. De Narvaez, Colombian Army. *Memo. Estado Mayor* (Colombia), May, '15. 400 words.]

Gives method of converting readings from Réaumur, Centigrade, and Fahrenheit scales.

THOMAS, Gen. Geo. H., U. S. A.

[General George H. Thomas. By Maj. Gen. T. M. Anderson. *Jour. Military Service Inst., U. S.*, Jan-Feb, '15. 2500 words.]

A considerable number of officers and men of the northern armies were of southern birth so that the struggle was not altogether sectional, though it appeared so much so at the beginning that Secretary Stanton's official acts in dealing with commissions issued to Union officers from the South were colored correspondingly.

Gen. Anderson speaks from intimate personal acquaintance with Gen. Thomas and relates interesting incidents to show the difficulties under which the Union officers of southern birth labored.

General Anderson was given an opportunity by his kinsman, Gen. Robert Anderson, to recommend Thomas for appointment as brigadier general for service in the Department of Kentucky, and in support of his recommendation cited some of the incidents referred to above.

Thomas' attitude towards the early campaigns in Virginia was always that they should be aggressive, and he always contended that the northern forces were as well prepared as the southern. He maintained discipline correctly at all times, and his action in suppressing a mutiny in October, 1861, was characteristic.

Thomas is compared favorably to Washington in appearance, deportment, and character, and though leaving no sons, his heritage to his country was his decisive victories.

TOPOGRAPHY, MILITARY

See

EUROPEAN WAR—TOPOGRAPHY
FIELD ARTILLERY—INFLUENCE OF GROUND ON
RECONNAISSANCE
SIEGE ARTILLERY—MAPS FOR
SKETCHING

See also subhead MILITARY TOPOGRAPHY *under names of countries and other geographical sub-divisions and subhead* TOPOGRAPHY *under specific Wars, Campaigns, Battles, Sieges, etc.*

TORPEDO

See also

LEON TORPEDO

—Aerial

[The Aerial Torpedo. Reprinted from *Le Temps. Arms and the Man,* July 22, '15. 400 words.]

The aerial torpedo was invented in 1900 by Major Unge of the Swedish Army. It consists of a cylindro-conical shell of extremely elongated type, divided, in its interior, into two unequal compartments by a partition perpendicular to its axis. The larger compartment, at the head of the projectile, receives the charge, and the rear compartment carries the powder intended to produce, by its combustion, the necessary propelling force. The base is pierced by a number of spiral ducts which allow the escape of the gases of the propelling charge, and being a sort of turbine, gives rotation to the shell. In the head of the projectile is a percussion fuse which, by the operation of rotation, develops into a time fuse as soon as the rapidity of rotation reaches a certain degree. Initial movement and direction are given by a small special gun.

In the first experiments, in 1901, the shells contained 5½ pounds of explosive, and had a range of 4 miles. The Swedish government did not see fit to utilize the invention, and Major Unge sold it to the German government after perfecting it so that it now carries 440 pounds of explosive 10 miles.

(The data from which this article was written came from a document published by the Germans two years prior to the present war, and it is not impossible that further improvements in the machine have made it available for long range bombardments, such as have been attributed to the heavy artillery of the German army.)

[An Air Boat Torpedo. *Aerial Age,* Aug. 2, '15. 250 words.]

Rear Admiral Fiske of the United States Navy has recently invented an aerial torpedo for attacks on ships in protected harbors. In brief the plan consists of arming a monster aeroplane with a Whitehead torpedo of the regulation navy type. Started at a distance of five miles, it releases its torpedo just as does a destroyer, the impact with the water setting in motion the torpedo's machinery. The projectile is released inside the harbor, and moves towards its target with a forty-knot speed. The aeroplane then rises and moves on. It is possible to employ a radio-controlled machine, by which the flight of both the machine and the torpedo are regulated and directed.

TORPEDO BOATS

—Defense Against

See

COAST ARTILLERY—GUNS—SMALL CALIBER

TRAJECTORY

See also

BALLISTICS

—Graphical determination of

[A Criticism of Dr. Rothe's Discussion of "The Graphic Determination of the Trajec-

tory of a Projectile." By 1st Lieut. Narath, Res. Inf. Reg. No. 17. *Artill. Monatshefte.* Feb., '1915. 2000 words.]

The results obtained by Dr. Rothe's method, as described in the Jan., 1911 number *Art. Monatshefte,* do not agree with practical results obtained by Krupp nor with those obtained by Siacci. The discrepancies are not due to the application of Siacci's law III, nor to the co-efficient of form $i=0.865$, as is supposed by Dr. Rothe. The hypothesis made that the air currents produced by the air resistance resemble the lines of stream flow in water is also incorrect. The discrepancies are all due to Dr. Rothe's application of the method itself. He makes hypotheses which he is unable to prove. So, for instance, he determines the velocity at the end of an interval of time dt, whereas, as a matter of fact, it should be the average velocity during this interval of time. He also arbitrarily chooses an interval of time without considering whether it corresponds to the velocities under consideration. He should have first determined v as a function of time and integrated; then subtracted from this the loss in velocity due to the component of gravity and thus obtained a curve V' as a F' (t). Dr. Rothe also makes other errors in the succeeding diagrams, and all of these are dependent upon the error made in the first diagram. The results obtained by his method vary so largely from practical results of Krupp's and those obtained by Siacci that they are of very little practical value. The graphical methods of Prof. Cranz, of the Militär-Technische Akademie, Berlin, are shorter and give better results:

	X	T	w	V_r
Siacci	20588 m.	43.5 sec.	34° 46'	348.4 m.-sec.
Krupp	19100 m.	41.9 sec.	34° 45'	346 m.-sec.
Rothe	26500 m.	77. sec.	23° 20'	272 m.-sec.

[Reply to Lt. Narath's Criticism of My Article, "The Graphic Determination of the Trajectory of a Projectile." By Dr. Rothe, C. E. *Artill. Monatshefte,* June, '15. 1600 words.]

(NOTE.—This article is controversial in its nature, and consists in the discussion of the mathematical correctness of certain equations used by Dr. Rothe. The article does not admit of satisfactory condensation.)

The Editor, *Artill. Monatshefte,* comments as follows: "Although I am not convinced of the correctness of Dr. Rothe's principles, I must give him credit for having in a measure cleared up some doubtful points, but the practical application of his equations shows radical differences from the results given by Krupps."

—Graphical registry of

[The Trajectory by Stereophotogrammetric Photographs. By A. v. Huberth, C. E. *Artill. Monatshefte.* Feb., 1915. 2000 words.]

The object of this method is to determine graphically the ballistic elements of the trajectory. The firing takes place at night. The projectile is bored obliquely across to receive a mixture of magnesium of high illuminating and actinic properties. The photographs of the projectile's trajectory are then taken by the stereophotogrammetric methods, as follows: The photo cameras are placed in pairs every 100 m. of the range, distance between pairs 10 m. Each camera has a main shutter connected electrically with the gun, and an interrupting instantaneous shutter permitting exposures of 1-200 of a second and operated by a recording induction-chronograph which registers time intervals of 1-200 of a second. The cameras are all connected electrically with the chronometer. The discharge of the gun breaks the first circuit, opens the main shutters and starts the interrupting instantaneous shutters revolving. As the projectile passes each camera the plate is exposed. By means of a sensitive transmitter placed between each pair of cameras, the current is again broken after the projectile has passed the camera, and thus closes the main shutter again and prevents the registration of time. The resulting photographs show a series of dashes grouped at fixed intervals. The fixed intervals show the unit of time 1-200 of a second; the dashes the number of revolutions made by the projectile during this interval. These photographs are then put under the stereo-comparator and the necessary measurements taken to obtain the elements of the trajectory, such as its form, inclination of the tangent at every point of the trajectory, the velocity, and the velocity of rotation.

TRANSPORTATION

See
SUPPLY AND TRANSPORT

TREATIES

—Of Peace

[Modern Treaties of Peace. By Sir John Macdonell, K.C.B. *The Contemporary Review,* Sept., '15. 4500 words.]

Truism as it may be, the character of a treaty terminating a war is conditioned by the result or issue of the war itself. If the victors are allies, the vanquished by skillful diplomacy comes off a little better than if there were only one conqueror. As a rule, modern treaties of peace are lacking in generosity, chivalry, or forbearance to the vanquished. In nearly all of them stands out the desire to use force to the limit; the diplomatist is severer than the soldier. Broadly stated, every modern treaty of peace, not the result of a drawn battle, is what the Romans called a *foedus iniquum.* Exceptions of course may be found, such as the Treaty of Paris, Dec. 10, 1898, and possibly the Treaty of Pretoria.

Nations differ in the manner in which they use their advantage as victors. Under this head none is wholly free from reproach. The type of victor ruthlessly demanding his pound of flesh and more, is Prussia.

In some respects modern treaties of peace are apparently more humane than ancient. For example, none declare the lands of the citizens or subjects of a conquered state to be forfeited; some indeed expressly confirm these in their rights. On the other hand, this effect has been somewhat diminished by the imposition of indemnities. Burke regarded this innovation as objectionable; Fox approved it.

TREATIES—Continued

Whatever be the opinion held, the practice has become common. Three forms exist: 1° An indemnity in the strict legal sense, i. e. reimbursement of the expenses to which the victorious state has been put; 2° An indemnity coupled with a reasonable fine; 3° The exaction of a sum bearing no relation to the cost of the war, and intended to impoverish the payer, so as to prevent a renewal of hostilities, a sum measured by the resources of the conquered country. The classical instance of the third type is furnished by the Treaty of Frankfurt; of the $1,000,000,000 exacted, $400,-000,000 was mere plunder.

Another feature of modern treaties of peace is the amnesty clause. Its omission from some recent treaties does not imply that immunity from punishment for acts in the prosecution of the war shall not be given. Other features are in the nature of defects. For example, it is apparently no longer admitted that Europe is a political unity; the very ideal of unity seems to have disappeared. Modern treaties rarely show any perception of common interests of a general society or family of nations. Each state or group of states is out for its own hand. Another defect is the disregard of the principle of national feeling: strategic considerations, the desire to acquire rich territory, determine the conditions of peace.

On the whole, the world seems to have moved back. "We look in vain for constructive treaties of peace; those which form new ties between countries and uproot the causes of war." The modern treaty of peace appears to be little better than a truce; it rarely fulfils expectations. Framed with reference to passing exigencies to obtain the maximum of advantage to the conqueror, it is usually a monument of the limited foresight of diplomacy.

TRENCHES

See

ENTRENCHMENTS

TRINITROTOLUENE

[Trinitrotoluene. By "E. P." *Revista de Artilharia,* Apr, '15. 750 words.]

Many armies are adopting trinitrotoluene as the base of their shell-fillers, instead of picric or ammonium nitrate compounds. It is very safe in manufacture and handling, burns without exploding, and has no bad effects physiologically. It is a yellow, odorless, crystalline solid, insoluble in water but soluble in alcohol, ether and benzine. Its specific gravity is about 1, but it may safely be compressed to 1.68. It melts at 81° C. A mixture of dinitrotoluene and nitrocellulose forms a very plastic explosive called triplastite.

TRIPLASTITE

See

TRINITROTOLUENE

TRIPOLI

—Italian Operations in (1911-13)

See also

FIELD ARTILLERY — USE OF IN ITALIAN OPERATIONS IN TRIPOLI

TROPICAL DISEASES

See also

BILHARZIOSIS

TSINGTAU, Siege of

[Siege of Tsingtau. Contemporaneous Notes on the European War. Editorial. *Artill. Monatshefte,* Mar, '15. 5000 words.]

The first German covering detachment consisted of 1000 men and occupied a front of 10 km. The first naval bombardment took place on Sep 28, in which the Japanese ships *Suwo* and *Tango* and the English battleship *Triumph* participated. The noise and effect of these bombardments which took place almost daily were terrific. The Japanese advance by land was slow but irresistible, and soon they were attacking the outer defenses. Two light German cruisers in Kiautschou Bay rendered valuable service. On Oct 5th the captive balloon was destroyed by shrapnel. There was only one aeroplane available. It was constantly in use and obtained important information. On Oct 14th the sea-works underwent a severe bombardment and the *Triumph* was hit. Through spies it was known that the Japanese would make a strong effort to take Tsingtau on Oct 31st, the anniversary of the Emperor's birthday. The Japanese had succeeded in completing their land batteries on the 30th. The bombardment began at 6 a. m. on the 31st both from land and sea, and continued until dark. The effect and destruction were terrific. The hostile columns then attacked when night came, but failed due to the withering fire of the German Artillery. The next day was quiet. The Germans now held a line of 5000 meters with 3000 men. The Japanese, however, methodically pushed their advance to the wire entanglements by sapping and on the night of the 6th-7th Nov. made their last attack, the main force being directed against Bismarck Hill. The fort then capitulated.

TURKEY

[Turkey. *Información Militar del Extranjero,* Madrid, May, '15. 7500 words.]

(A short account of the origin and distribution of the Turkish people, the present political limits, including Egypt and Sudan, the organization of the government, commercial development, and military resources.)

—Army

See SHUKRI PASHA

—Army—Cavalry

See also

CAVALRY—USE OF IN BALKAN WARS

—Army—Equipment

[How the Turkish Army is Equipped. *The Sphere.* Mar. 6, 1915. 600 words, illus.]

Recent information from Turkey shows great improvement in mobility of the Turkish transport service, due to purchase of an immense number of motor lorries in Germany.

The fur fez is being replaced by a new headgear in which the turban was first made to approximate to a sun helmet. Later the turban was placed on a straw form. The rest of the Turkish uniform is cotton and wool khaki, exactly like the English.

Due to the work of the Red Crescent Society, great progress is being made in ambulance work. The instruction is thorough. A Boy Scout movement is making progress.

—History

See

BALKAN WARS

EUROPEAN WAR

PLEVNA, BATTLES OF

TYPHUS

See also

VERMIN EXTERMINATION

—In Serbia—Work of American Sanitary Commission

[Lipton Praises American Surgeons. *Jour. Amer. Medical Assn.*, July 24, '15.]

Sir Thomas Lipton, in a recent communication, classes the work of the American surgeons and nurses in Serbia as miraculous. "The first time I was at Ghevgheli," Sir Thomas wrote in picturing the transformation in Serbia, "there were 1400 patients there, mostly with typhus. When I was there the other day there were only three typhus cases." He described as "miraculous" the work of Dr. Richard B. Strong, the Harvard professor of tropical diseases, in charge of the American sanitary commission in Serbia and Montenegro, and his staff, "Their work is miraculous. Many hospitals where they have been working which I visited the last time I was in Serbia were full of typhus cases, but when I called this time they had no typhus cases. At Uskub, Dr. Strong's headquarters, some of the hospitals are closing up. I could hardly believe that the staff you sent out here could have made such a change. The terrible sights that I witnessed in connection with typhus when I was in Serbia the last time now are finished. What is now badly needed is for the country to be put in a proper sanitary condition to prevent these epidemics in the future."

UNIFORM

See also

SHOES

Germany

[The New German Field Uniform. By Hilmar H. Weber, M.A., M.L., University of California. *Infantry Jour.*, May-June, '15. 2400 words.]

The new field uniform, which is immensely popular in Germany, is a great success. While adopting all the advantages of other campaign uniforms, it still has a pre-eminently German appearance and does not mean any abrupt break with the uniform traditions of the German Army.

Most campaign uniforms have patch pockets. Those on the breast are hard to get at, are crossed at the top by equipment straps, or else those at the bottom, where heavier objects soon find their way, are painfully pressed against the body. Not so the German pocket, which is set in diagonally in the skirt of the blouse or tunic and is placed inside, so that even if bulging full the appearance is good.

The collar is a falling collar which can be turned up for warmth. Except for a few cases, the uncomfortable standing collar is banished.

The color, field gray and field green, naturally promotes invisibility on their fields of campaign. The American system of insignia, etc., is unknown to the Germans, who secure the differentiation by the color of the buttons, style of cuffs, color of the facings, pipings and the like. (Specific uniforms are here described.)

The colored pipings and facings do not destroy the invisibility, as might be surmised; it might be argued on the contrary that the colors retained adapt themselves to a terrain where the vegetation is never of an entirely uniform color.

The system, while radical enough, is yet immediately intelligible to anyone familiar with the former German uniforms, which are not discarded but reserved for all duty, except campaigns and maneuvers.

UNITED STATES

—Aeronautics

See

AERONAUTICS — ORGANIZATION — UNITED STATES

DIRIGIBLES—UNITED STATES

—Aeronautics—Advisory Naval Committee on Aeronautics

President Wilson appointed, April 2, the twelve members of the Advisory Committee on Aeronautics authorized under the Naval Appropriation act. The appointees, who will serve without pay, are:

General George P. Scriven, chief signal officer; Lieutenant-Colonel Samuel Reber, Aviation Section, Signal Corps; Captain Mark L. Bristol, U. S. N.; Naval Constructor Holden C. Richardson, U. S. A.; Dr. Charles D. Walcott, secretary of the Smithsonian Institution; Charles F. Marvin, Chief of the Weather Bureau; Dr. S. W. Stratton, Chief of the Bureau of Standards; Byron R. Newton, Assistant Secretary of the Treasury; Professor W. F. Durand, Leland Stanford University; Professor Michael I. Pupin, Columbia University; Professor John F. Hayford, College of Engineering, Northwestern University; and Professor Joseph S. Ames, Johns Hopkins University.

—Aeronautics—Naval Hydroaeroplanes

Bids were called for by the Navy Department on Feb 5 (opened Feb 17) on the construction of six armored hydroaeroplanes, each to carry a rapid-fire gun and ammunition and to be manned by a pilot and an observer. The general requirements were for a machine having a maximum speed of at least eighty miles an hour, a radius of action of four hours at full speed, ability to climb 250 feet per second for the first ten minutes, and to glide at an angle of six to one. The machine must be able to get off the water and alight in the open sea under ordinary conditions, to ride at anchor or adrift without danger of capsizing and to fly safely in a thirty-five-mile breeze.

—Army

[Army Reorganization. *Army & Navy Register.* May 1, 1915. 700 words.]

UNITED STATES—Continued

The Secretary of War has written a letter to the Board of Review, indicating his purpose of submitting to Congress at its next session an elaborate plan for the National Defense. It is his opinion that this country "has never had a well thought out, wrought out, and agreed upon Military Policy."

[The Administration's Program. *Arms and the Man.* Oct. 21, '15. 1000 words.]

The plans approved are progressive in character. In dollars and cents, the land defenses will call the first year for $184,000,000, the naval $500,000,000, to be expended in five years. The Secretary aims at turning out in six years 1,000,000 men of military training. A new force of "Continentals" is to be formed by enlisting 133,000 young men each year for six years. During the first three of these, they are to spend two months out of every twelve in field service; during the last three, to be on furlough.

The main points of the plan of land defense as approved by the President, are: (1°) A first line of over 600,000 men (regulars, militia and continentals) in three years, and over 1,000,000 in six years; (2°) An increase of the Regular Army to about 140,000 during the next two years; (3°) A 6-year enlistment in the Regular Army, two with the colors, and four on furlough; (4°) An increase of the National Guard, by federal support, up to 150,000 men.

The Regular Army is to be increased by 10 regiments of Infantry, 52 companies of Coast Artillery, 4 regiments of Field Artillery and 15 companies of Engineers.

The Naval 5-year programme calls for the building of 16 capital ships, 64 destroyers, 100 submarines, 15 scout ships, and 15 ships of other types, such as fuel ships, transports, etc.

See also
United States—Military policy of
United States—Militia
National Guard (U. S.)

—Army—Army Posts

[Cost of United States Army Posts and Stations. *New York World,* Sept. 28, '15. 800 words.]

A staff correspondent in Washington sets out in tabulated form the cost of 176 army posts and stations. The sum for 1914 exceeds $172,000,000. Many of these posts are recognized as useless, but local influences excited through Senators have proved strong enough, so far, to prevent their abandonment. General Wood is quoted as saying that the number of mobile army posts could be cut in two, were it not that the extensive and expensive construction at many places causes hesitation; it is hard work to justify abandonment.

—Army—Artillery

See also
Coast artillery—United States
Field artillery—Drill regulations—United States
Field artillery—Heavy—United States
Field artillery — Materiel — United States

—Army—Bands

See
Bands—Military—United States

—Army—Cavalry

See also
Cavalry — Drill regulations — United States
Cavalry — Organization — United States
Cavalry—Service regulations—Single vs. Double rank formation
Cavalry—United States
Cavalry—Volunteers—United States

—Army—Coast Artillery

See
Coast Artillery—United States—Coast artillery corps
Machine Guns—United States

—Army—Infantry

See
Infantry—United States

—Army—Legal powers of

See
Martial law

—Army—Motor Transport

See
Motor transport—United States

—Army—Personnel

Under an order issued by Secretary Garrison April 28, which became effective April 29. Brig. Gen. Hugh L. Scott of the General Staff of the Army was promoted to be a Major General. The promotion was made possible by the retirement of Major Gen. Arthur Murray, who retired April 29, but by virtue of legislation will continue in command of the Western Department until the close of the San Francisco Exposition. The vacancy in the list of Brigadiers-General, was filled by the promotion of Colonel Frederick S. Strong.

—Army—Reserve

[An Army Reserve. By Lt. Col. Charles G. Davis, Illinois National Guard. *Infantry Jour.,* May-June, '15. 1800 words.]

For reasons that are known to all military students, it is acknowledged by most officers that the militia as organized under Federal Law and State Constitutions cannot be made an efficient military force. The little prestige it may have had is gone with the recent publication of its military force. It has under present system of dual control reached its limit of efficiency. The vital requirement is that great essential of all organization, that absolute essential for military success, centralized authority.

It is believed that the force now known as Organized Militia could be organized by Congress, not under "Militia" but "to provide for common defense," "to raise and support armies," etc., which would make of it a constituent part of the Army of the United States. The act should provide for the mustering into the regular service of such units not greater than a regiment nor less than a company, as would volunteer within, say, four months. Officers would be appointed by the President.

Brigades, divisions, and field armies could be organized with higher officers detailed from the Regular Army, others being appointed by President from among the most deserving. The organizations could retain or be given state designations as 1st Illinois Infantry U. S. Army. This incorporation will give prestige and men of the highest type would seek commissions in this Federal service.

Armories and rifle ranges should be taken over by the Federal Government. Officers and men should be paid. The enlistment contract should provide for service during the period of the war, when called into active war. This Army Reserve should be available for service in aid of civil authorities. The civil duties and obligations of members should not be restricted except in that they yield to the obligations of the Army Reserve when called on as such. It is not a state force; this latter should be police officers, not soldiers.

In any case, to make of the Organized Militia an effective military force, its status must be changed.

[Why We Should Have a Federal Reserve. By 1st Lt. J. D. Reardan, Infy. Aide de Camp. *Infantry Jour.*, May-June, '15. 2400 words.]

The reply to this question will be obvious from a comparison of a few of the parallels below:

The Civil War and the present war are more nearly similar. In each case the territory of the belligerents is contiguous; the military training and preparation bear about the same relation; and the suddenness of the outbreak of these two wars is the same.

On April 15, 1861, President Lincoln called for 75,000 volunteers; on May 3 a second call was made for 500,000. On July 1, seventy-five days after the first call and fifty-eight days after the second there were 169,440 men enrolled. Seven months and one-half later this number, equal to 7-10 of one per cent of the North's population was ready for the field. Every day of this period cost the government $5,000,000.

Germany pushed an army of 750,000 men, i.e., 1.4% of her population, 200 miles into hostile territory in 30 days. Germany produced an army, relatively twice the size of that of the North in 1861, in 1-100 of the time.

Bull Run is the same distance from Washington that Liége is from the German border. It took the North three months and nine days to get a "body of men" to that battlefield and suffer defeat. It took 6 days for Germany to hurl an army corps against Liége and but 6 days more to completely invest that stronghold.

Germany placed 7-10 of one per cent of her population on the Franco-Belgian boundary line in 18 days. The North placed 7-10 of one per cent in the Peninsula in 383 days. Distances are the same.

Did we profit by the mistakes of the Civil War? One and one-half months after war was declared against Spain we sent 16,000 men to Cuba against 200,000 regulars of Spain. Only 3 small regiments of our force was regular. A marvelous procedure on the part of the Spanish commander fortunately gave us the victory.

We spend now relatively less than 1-5 of what was spent in 1880 for prevention. We object to paying for prevention the one-one hundredth part of what we have been forced to pay for cure.

Measures of prevention have been and are being proposed by those who are qualified for the task. The value of military training must be conceded by all and the best means that offers seems to be a Federal Reserve.

[A Layman's Plan for Organizing a Reserve Army. By Frederick M. Ives. *Infantry Jour.*, July-Aug., '15. 6000 words.]

The important question of procuring suitable officers for a reserve army has been much neglected. No system of reserves can be adequate unless it secures a full complement of officers. To be acceptable to the people, the reserve army must be cheap, unmilitaristic in spirit, and put no burden of military duty on the public. To be acceptable to the government, the system must be capable of securing an efficient, ever-ready, and numerically adequate fighting force.

Of the $16,500,000 herein called for, $12,000,000 is for the college education of 12,000 young men; $2,000,000 for the partial education of 14,000 more young men; and only $2,500,000 devoted to purely military purposes. The advantages are its economy, its ability to produce officers, and the ease with which it could be started on a smaller scale than hereinafter proposed. The chief objection is that it is incapable of producing any results inside of two years, after which the Reserve would increase by 50,000 men per year.

The estimated force exceeds the actual force on hand, counting both Regulars and mobile, by 430,000 men, of which one-twentieth must be officers and one-eighth non-commissioned officers. If soldiers are fit for service for eight years after the period of training, we must add yearly, including wastage due to disease, death, etc., about one-seventh of the total to the Reserve, or 3000 officers, 7700 n. c. o., and 44,000 men.

To secure the 3000 officers, it is proposed that the government endow 12,000 four-year college scholarships among existing universities and colleges proportioned according to population. Students to be chosen after competitive examination into their mental and physical fitness.

In return for this education, the student enlists for twelve years, four active years in college; eight years in the Reserve, which latter shall require only that he report yearly name and address, and that he respond at once for active duty with the colors if called by the President.

During the college course, the government will require 8 hours weekly for four years of forty weeks and three vacations of ten weeks, in all, the equivalent of 370 days of military training. In exchange for this, the applicant receives a college education free of cost; an incalculably valuable physical and disciplinary

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education; an adequate military education; and a commission in Reserves, ranking from Captain down, upon graduation. The cost is moderate, the military training being in the nature of a by-product. There would be no economic waste, as the outlay would be spent on education and would be of direct national benefit. However, in dollars, the 12,000 cadets, 240 Regular Army instructors and 600 n. c. o.'s, would cost, say, $11,000,000 yearly.

The n. c. o.'s would be obtained from the Regular Army, after certain changes had been made, to wit: A ten-year enlistment period, of which 2 active and 8 with the reserve; and an increase of 25,000 in army; also the abolishment of encouragement to re-enlist, except for n. c. o.'s and special service troops. This will produce yearly 62,500 men for the Reserve, and, allowing for wastage, will produce the 430,000 necessary. To train 7000 n. c. o.'s yearly special Regular Army schools must be founded. Extra pay yearly of $100, plus cost of instruction ($100 per man), requires $2,800,000. The yearly pay is to induce men to enter the schools, etc. They receive warrant of n. c. o. after two years of active service.

No duty should be required of reserves in time of peace, since military value of such service is small. Spend the money rather on training of higher officers. By abolishing useless army posts and the extra pay for re-enlistment, the regular pay could be increased without adding to the cost of army. If no duty be required of Reserve privates, no pay is necessary.

Service should prove attractive for the above reason; also that every eighth man would receive $100 yearly, as well as educational advantages which will increase his earning capacity. Since active service is so short, and duties in Reserve not onerous, enlisting will not be a serious step as it is now. If these inducements are insufficient, more could be added.

About $5 per year per man will keep track of each Reservist, his condition, etc.

The economic gain to the country from the expenditure of this $16,500,000 is enormous. The education dispensed would stimulate industrial strength and productive capacity greatly, for in addition to the 12,000 men under education, we would have, after 8 years, a well-trained Reserve of 430,000 men; at the end of 16 years, a much greater force; of invaluable aid as depot guards, instructors, etc; also 50,000 educated men, whose opinion would be invaluable in molding the country's future military policy.

To-day, every trained soldier has cost the country $1000 per year; after the proposed system is established it will cost $38 per year, and deducting the money really put mainly in lay education, the cost would be only $6 per year per man!

War efficiency depends upon armed numbers and mobility. The proposed plan provides for the former; to secure the latter, establish military districts, complete with base depots for arms and clothing of units assigned. Reservists are to be assigned to companies in their districts, all data necessary to be given him upon leaving active service. All higher Reserve officers to be regular officers, and all lower to be obtained as indicated. Political pressure is thus eliminated. Units should be named, not numbered, as this localizing will foster recruiting in its appeal to state pride. Reserve units could thus acquire local traditions and support, without losing their national character and independence of state control.

This requires time, and the present makeshift must be encouraged in the interim. We must not fail to recognize the fact, however, that any unit must have a living organized existence, with bases of supply established before the day of need has actually arrived. It cannot be called into being overnight. This scheme can be undertaken at once on a small scale; it is truly economical, as it uses the present educational plant. The idea will grow, and we shall not only strengthen our military defenses, but also develop our national industrial and economic life.

[The Army Reserve. *Army and Navy Register,* Sept. 4, '15. 800 words.]

If Congress in its next session is really going to take up the question of an Army reserve, the great demand of this country will be for officers. It seems to be believed that these will come from the military and semi-military schools of the country, and that an enlisted personnel can be secured by a one-year enlistment in the Regular Army. It is obvious, however, that the inexperienced reserve officer, hurried in from civil life will be more a student himself than an instructor of others. Between the qualified private and the West Point graduate comes the "backbone of the army," the non-commissioned officer. Admitting the fact that our present n.c.o.'s are capable in every sense of the word, it is also true that they are few and becoming old. Promotion should be possible in the non-commissioned grades. This implies some system of retirement, e. g., grade retirment after 16, 20, 24 years' service, and this in its turn implies new legislation. It would seem just to send our excellent n.c.o.'s after retirement into the civil service. Limiting a man's service so as to make the life-long soldier an impossibility, and at the same time providing for the old-timer now in the service, may be found practicable. The point sought is to return to civil life the n.c.o. at an age when he could still be of some use if recalled into the service.

[An Available Reserve. By Captain V. M. Elmore, 22d Infantry. *Infantry Jour.,* Sept.-Oct., '15. 2250 words.]

The vital necessity of a body of trained men to meet the first onslaught of the enemy is apparent to the average mind. This body must be organized to the utmost details to be efficient. Undeveloped natural resources mean nothing. All our gold, coal, and iron in the ground is but an invitation, not a defense. General Joffre's recent remark, "Woe to those who are not ready," is extremely pertinent to us.

A large army is probably impossible for the United States, so a reserve must be created, and even that curtailed so as to not be a monetary burden. Recruiting should be carried on by the postmasters of country districts. If they were paid for this, results would follow. Enlist the young man between 19 and 30 for three years. Upon discharge, he becomes a reservist until he reaches 37. Discharge him at the ending of the first year or second year if a practical test shows him a well-trained and disciplined soldier, with a good knowledge of marksmanship and field firing. As a reservist, sworn to report to nearest postmaster for orders in case of war, he should receive a monthly pay of $5 in return for his name and address reported monthly. The War Department is to refund to the Post Office Department.

If we realize that this plan means in 12 years approximately one million men, ready and available upon 48 hours' notice, the simplicity and ease of its operation are convincing. Any reserve must consist of those who are ready to fight, not simply those willing to fight. Precaution and preparedness are synonymous with defense, not offense.

See also

AMERICAN LEGION
EDUCATION, MILITARY—BY CORRESPONDENCE
INFANTRY—FIRE—RIFLE SHOOTING—ORGANIZATIONS (U. S.)
NATIONAL GUARD (U. S.)

—Army—Resignation from

[Should Officers Be Allowed to Resign? Quoted editorials from various newspapers. *Infantry Jour.*, Sept-Oct, '15. 800 words.]

Sixteen editorials are quoted condemning the idea of permitting officers to resign from the army to accept lucrative positions in civil life. This condemnation is based generally on the ground that the education and training which makes the services of these officers valuable in civil pursuits was given to them by the government; that the officers accepted this education and training well knowing what was before them in the way of compensation in the army; and that in view of these conditions, an officer is not justified in leaving the military service for pecuniary gain, particularly in view of the small size of our army. Ten editorials are quoted in favor of accepting the resignations of officers on the ground that such officers will re-enter the service in any emergency, and that their assistance in building up the capacity of our factories in making munitions will be a valuable asset to the country in time of possible war.

[The editorials quoted are all from newspapers east of the Mississippi River, and are called forth by the recent resignations of officers to accept employment with firms manufacturing munitions of war.—ED.]

—Army—Schools and Training

See also

FORT RILEY MOUNTED SERVICE SCHOOL

—Army—Signal Corps

See also

AERONAUTICS—UNITED STATES
SIGNALLING
WIRELESS TELEGRAPHY—APPARATUS AND EQUIPMENT—PORTABLE

—Army—Staff

[Army Staff Detail System. *Army & Navy Register*, June 19, '15. 400 words.]

In anticipation of the legislation expected of the 64th Congress, some discussion comes up in respect of details to the Staff. It is suggested that details be limited to grades below that of lieutenant-colonel, thus making those of lieutenant-colonel and colonel permanent. According to some, this modification would be especially valuable to the Quartermaster Corps.

—Army—Supply and Transport

See also

MOTOR TRANSPORT—UNITED STATES

—Coast Defense

Construction of the emplacements for coast defense batteries at Fort Arthur, on Point Firmin, Los Angeles Harbor, was begun Jan. 3 by the United States government. Nearly $200,000 is to be spent on the batteries, while the entire fort is expected to cost about $3,000,000.

Guns of greater range and power than any that could be arrayed against them were asked for American coast defenses in a report of the Army Board submitted by Secretary Garrison and made public Feb. 18 by the House Appropriation Committee. The board advised that the old-type twelve-inch guns and mortars "are not equal in range and power to major-caliber guns afloat."

Mr. Garrison recommended the immediate improvement of some of the coast defenses, so that the range of the old twelve-inch guns could be increased to 20,000 yards, and the board suggested that wherever it was necessary to construct new works the larger guns should be sixteen-inch forty-five caliber weapons.

[Foreign Notes. United States. Coast Artillery Data. *Memo. de Artill.* (Spain), May, '15. 2500 words.]

(This is taken from the *Journal U. S. Artillery*, Mar-April, 1915. See INT. MIL. DIGEST, July, 1915, p. 88, and INT. MIL. DIGEST (quarterly), Sept., 1915, p. 50. The data given are commented on as follows):

Great importance is attached to the power and range of the coast armament, but rapidity of fire appears to be relegated to second place.

With us, to-day, this is the truly difficult point in the question of the armament of the coasts. If the pieces installed are to be truly efficient, it is necessary that they should be capable of as great rapidity of fire as the warships.

—Coast Defense—Aeroplane Scouts

[Aero-Radio System of National Defense. By John Hays Hammond, Jr. *Flying*, Aug., '15. 2000 words. Diags.]

It would take years, not months, for the United States to increase its military organization to the point where it could equal the standard of any possible enemy. Time is the thing that counts, not money. All the dollars on earth cannot increase the speed of manu-

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facture of necessary arms to supply the imminent demand.

Training of men is likewise a matter of years. The personnel must know how to handle the most intricate mechanism devised by man. From this it results that we must handle what strength we have available in the most efficient manner possible.

An invaluable unit of defense can be organized by applying radio systems to aeroplanes and the establishment of aero-scouting districts along the seaboard. Co-operation could thus be effected between the navy and the land defenses, so that the latter could be handled to best advantage.

Beginning on the Maine coast, it is proposed to divide the seacoast of the United States into scouting areas, each one equipped with an aeroplane carrying wireless, to communicate with a central station in the district. These areas are approximately one hundred miles in width, so that, by carrying wireless with a radius of sixty miles, the central station can be reached without difficulty at all times. Forty-four aero scouts can thus cover the coasts, and the estimated cost of the entire installation, including planes and receiving stations, would be less than $400,000.

By connecting the receiving stations by wire or wireless with Washington, we thus have a complete scouting system centrally controlled, and from Washington the orders could be sent to troops to protect any threatened part of the coast.

—Compulsory Military Service

[Compulsory Service in Hawaii. *Army and Navy Register*, May 1, 1915. 2000 words.]

A bill favoring compulsory military education in Hawaii has caused much discussion. Under this bill, all able-bodied young men arriving at 18 years of age must take 48 military lessons of two hours each under Army and National Guard instructors. General Carter upon invitation appeared before the House and urged its passage. Opposition has arisen, and the Secretary of War has been invited by opponents to deal with the situation. The purpose of the legislation is to teach young men proper sanitary methods and social hygiene, first aid methods, and how to protect Hawaii. Penalties are provided for non-compliance with the provisions of the bill.

[Army Needs. By Col. J. H. Beacom, U. S. A. *Army and Navy Register*, Sept. 11, '15. 3000 words.]

Rejecting the voluntary system of enlistment as inefficient and unpatriotic, it is proposed to adopt the "enlistment by lot" method. The benefits that would follow the adoption of this system are:

1. The establishment of a standard of patriotism.

2. Production of men needed for peace service, and of a great reserve for war.

3. Less cost per man than present system.

Practically a certain percentage of the youth of 18 years of age would be taken, trained from October 1 to the end of the following August, and then returned to their homes. Assuming the population of the U. S. to be 100,000,000, 960,000 are males 18 years old. Rejecting half as physically unfit, and taking 10% of the remainder, we should have to train every year 48,000. Reserve officers for future necessities could be obtained by selecting the best of each annual class and, after competitive examination and test, retaining them in service for a six months' or a years' course as candidates for a commission.

[Conscription or Pay, Which Shall It Be? By Col. Robt. F. Leedy, 2nd Inf., Va. Volunteers. *National Guard Magazine*, Oct, '15. 5100 words.]

A year of war in Europe has awakened us to an almost hysterical desire for preparedness. The subject needs cool discussion. We have a definite military policy, which has been clearly defined in the messages of the early presidents, but it has never been carried out. Neither over preparation nor compulsory service are needed in a country where no possible contingency would require the services of one fourth of those physically qualified. However, a force of well trained officers and men adequate to meet any emergency should at all times be ready for service.

Notwithstanding the publicity given to the Plattsburg Camp, it offers no adequate solution of the problem of creating such a force. The National Guard is worthy of some of the attention given to this camp, as they have given regularly to military training a much greater share of their time than did those who attended the Plattsburg and other camps of instruction. If the Plattsburg camp was meant to train officers for volunteers, it is doubted if men would knowingly volunteer for service under officers of such scant training.

Other plans of defense are suggested from other quarters, among them one calling for a regiment of infantry from each Congressional district, giving an army of a total strength of 1,000,000 men. Where are the officers to come from? 40,000 of them are needed, and the militia has only 9,000. At the rate of 1000 a month it would take two years and a half to supply them. Next, where are the men to come from? It is well known that recruiting for the present Regular Army is a problem in prosperous times. The proposed army of Federal Volunteers could therefore only be secured by conscription, in which case the name Volunteers is a misnomer.

Our military policy as handed down from our fathers, places the main reliance on the militia. Citations from the Constitution and from Presidential messages from Washington to Lincoln show their belief in this force, as the principal military strength of the nation.

The true solution is a combination of a Regular Army should be increased. How can small compared to the latter. Even so the Regular Army should be increased. How can a large militia force be secured? The answer is—Adequate pay, and a just and fair system of promotion, or compulsory military service.

The National Guard should be trebled, but it cannot be done without reasonable pay, be-

cause modern conditions demand higher military training, and the trend of instruction in public schools smothers patriotism. With reasonable pay, however, the desired force can be secured.

We must have a larger Army and we should have a National Guard twice as large as the Army, and the two should become one in war. They should be sufficient to care for the defense until volunteer forces could be trained.

The National Guard has been federalized in all respects except the appointment of officers. Although the election of officers may not give perfect results, appointment might easily result in no improvement. Many appointments by the executive of general and staff officers show that this method is far from perfect. It is believed that the election system is best, if safeguarded by examination. Appointed or elected, Congress can fix the standard of fitness.

Let us pay the Army and the National Guard adequately, and hope that every state will do its part. When this has been tried and has failed, it will be time to bid farewell to free institutions and resort to conscription.

[Will Pay or Universal Service Solve Our Problems? By "Federal Control." *National Guard Mag.*, Nov., '15. 1700 words.]

Pay will not attract the class of men desired. Some officers say that it would be humiliating to accept as *pay* for their services the sums proposed. Pay would alienate the support of the National Guard. The writer has heard many fathers say that if the sons of wealthy parents were compelled to serve, they would be glad to have their sons serve also.

If our people would learn that each individual owes to the state a duty in the form of service in the army, the problem of enlistment would be solved. One small nation, Switzerland, stands in the midst of war untroubled because her citizens are trained and ready. Universal service, in the shops, on the railways, or in the fighting should be exacted with no exemptions.

—Compulsory Military Service—Instruction in Schools

[Compulsory Military Instruction at Schools. By Col. C. J. Crane, 9th Infantry. *Infantry Jour.*, Sept-Oct, '15. 2200 words.]

The education of the youth is a duty of the state; his military training is the duty of the general government. Australia and Switzerland have succeeded in combining into efficient and harmonious action the two powers, state and national. The result has been and is to secure partially trained recruits for their citizen armies, and to increase the civic efficiency of each individual. It is surprising that we have not adopted such a logical, economical, and provident course.

The true principle upon which to proceed is compulsory military service, no matter how many or how few recruits may be needed at any stated time. My own experience has greatly influenced my opinion as to the benefit and feasibility of including military instruction in the curriculum of every public and private school. The military training to follow might be made compulsory by separate legislation.

Boys of 10 to 12 years can readily be taught calisthenic movements, the steps and marching, salutes, and the close order drill movements of the company, without arms. This instruction is to be given in several periods of 15-20 minutes each daily.

Boys of 12-14 years continue in such work and progress to various drills in close and extended order and even in ceremonies; all without arms.

Fourteen year old boys and older should be instructed in every movement of the rifle, except target practice. These boys could be made non-commissioned officers, older ones commissioned officers in their school. Older ones should have target practice up to 300 yards; camping, cooking, sanitation, etc.

Argument seems wasted to attempt to prove the benefit to the nation and to the man of military instruction in schools. We have been shown the road by Australia and Switzerland, and the best of their ideas should be made our own.

—History

[The United States Navy in Mexico, 1821-1914. By Louis N. Feipel. *Proc. Nav. Inst.*, Sept.-Oct., '15. 2800 words.]

(Chapter VI of a continued history. This chapter deals with operations on the East Coast, such as the Capture of Alvarado, of Tuxpan, of Tabasco. A detachment of marines assisted in the storming of Chapultepec.)

See also
CIVIL WAR (U. S.)
EUROPEAN WAR—RELATIONS WITH UNITED STATES
MEXICO—INTERNMENT OF MEXICAN TROOPS BY U. S. (1914)
PHILIPPINE INSURRECTION
SPANISH-AMERICAN WAR
VERA CRUZ—U. S. OPERATIONS AT IN 1914

—Marine Corps

See also
FIELD ARTILLERY—MARINE CORPS—UNITED STATES

—Military Conditions

[Recent Defensive Developments in War. By Brig. Gen. James Parker, U. S. Army. *Army & Navy Jour.*, Nov. 6, '15. 1200 words.]

Many developments of the present war are favorable to a nation on the defensive. These developments are:—The submarine is cheap and quickly built, but it is a wonderful weapon of defense and a terrible threat to a battleship or to a troop transport; a war cannot be decided quickly and even an unprepared nation will be able to develop its military resources; aircraft operate to prevent surprises and hence to develop trench warfare in which troops that can shoot will have a chance; volunteers can be made into effective troops in a few months; coast fortifications can defy naval attack, and trenches are superior to other forms of defensive works; individual marksmanship is of great value, and nothwith-

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standing the development of field artillery, infantry remains the most important arm; the most necessary preparation is the accumulation of large reserves of small arms and artillery, and we have nearly a million rifles and nearly a thousand cannon; arms that were considered obsolete and weapons that can be improvised have been used; our network of railways would be of great strategic value in war; automobiles add greatly to the efficiency of an army as a means of transportation and supply, and we have 1,700,000 (Sept 1, 1915) of them; our type of cavalry, mobile and capable of dismounted action, is worth while, even if it costs one-third more than infantry; colored troops commanded by white officers have shown their value; our telephone and telegraph system would be of immense importance in defensive war; we produce copper, cotton and food-stuffs in abundance, and our resources are ample; the war abroad has served to develop our capacity for manufacturing war supplies; although foreign nations will be exhausted bv the war, this fact is not a guarantee against aggression; and finally, the European war is furnishing our citizens a course of military reading and study, the result of which should be to teach us the necessity of preparedness.

See also

NATIONAL DEFENSE LEAGUE (U. S.)

—Military Policy of

[Our Land Forces for National Defense. By George T. Fry. *Infantry Jour.*, Jan-Feb, '15. 3800 words.]

The time has arrived when somebody, not connected with the army, not interested directly or indirectly in the manufacture or sale of arms, ammunitions or supplies, and not persuaded to cut his facts to suit the exigencies of the hour, must state the plain facts of the military situation of the United States.

How best find the answer to the pertinent and seriously important query: Wanted, a military policy!

A military policy implies military protection and military protection belongs in the same category as fire protection, life, burglary and fire insurance, watershed dams, etc. Does any doubt exist as to the benefits to be derived from these mentioned safeguards? Military protection is national insurance. The size of our army would indicate that in future we are to deal with fourth class peoples and fourth class events, but how anomalous when we consider how rapidly we are expanding in area, population, commerce and in world affairs.

Striking a balance between the German extreme of preparedness and the British extreme of unpreparedness, we need in round numbers:

40,000 officers;
1,200,000 men of all branches;
1500 guns (field) additional to present stock;
900 field howitzers;
3,000,000 rifles;
400 army aeroplanes.

The necessary ammunition, equipment and transport for at least this force.

Automobiles, gasoline, reserve supply of smokeless powder, etc., must be ready and waiting.

With respect to figures above, which alone mean nothing, let us consider what we expect of the United States Army:

1. The protection of the several frontiers from invasion.

2. The preservation of law and authority within the states when demanded by the state.

3. The maintenance of such political principles with respect to the Monroe Doctrine as the civil authorities may order the army to enforce.

4. The policing and guarding of the Philippines, Hawaii and other like regions, with the protection of Cuba and Porto Rico.

5. The protection of the Panama Canal.

Notice clearly that the military power is not acting in pursuance of its own ideas in these instances, but purely to enforce the will of the civil population.

An invasion of the United States by a first-class power will never be made by less than 500,000 men. How is an army to be made ready to meet this force? We can

1. Increase the Regular Army;
2. Increase the Militia;
3. Form a reserve, independent of the Militia, and auxiliary to the Regular Army.
4. Institute universal compulsory military service.

The first two are impossible under existing conditions: popular opinion precludes the first; natural defects, constitutional limitations and local hindrances eliminate the guard from a just place in the scheme of successful organization. Personally I believe in compulsory military service: in return for his privileges a citizen certainly owes some service to the state. The great majority, however, regard compulsory service with horror and we therefore must rely upon the reserve force, auxiliary to the Regular Army. This force must be built upon the principle followed in the Philippine Regiments in 1899. Provide competent field officers for the new force by a transfer from the regulars. As to raising the men, one eighth of the 16,000,000 men of military age will give us the reserve force.

This reserve scheme requires legislation and revision of certain existing laws. In addition, the adoption of the following general plan is suggested:

1. Divide the country into 30 army corps districts, according to population.
2. Provide for the corps organization, for arms, ammunition and supplies ever ready for instant use.
3. Take a military census of each district and card-index every available soldier.
4. Keep on file the lists of graduates of military schools in the preceding fifteen years.
5. Have interested civilians appear before examining boards in each district for examination for commission.

6. Enlist reservists for 3 years, followed by 5 years of second reserve liability.
7. Provide for yearly maneuvres of at least two corps in size, so as to train officers to handle real armies.

It is essential not only that we meet the enemy when he comes but also that we be ready to meet him whenever he comes. Good sense dictates this course. The question is not to be determined by what nations are our friends but by what nations may, in any state of events, become our enemies.

[America Unready. *Literary Digest*, June 5, '15. 1100 words. 2 maps of New York and environs.]

[Press comments based on the concern excited by our defenceless condition. Dr. Hibben's and Mr. Garrison's speeches, both delivered at the Lake Mohonk Peace Conference in May, serve as a text for many expressions of approval. The press as a whole favors the movement to set our house in order: to quote Dr. Hibben's happy phrase, our objective should be "preparedness against war," not "for war." Quoting Hudson Maxim's book, "Defenceless America," attention is invited to the fact that within 200 miles of New York are "nearly all the important smokeless powder works, cartridge works, torpedo-boat works, small-arms works, and big-gun and armor-plate works in the United States."]

[Editorial Note. *Army & Navy Jour.*, June 5, '15. 100 words.]

It is stated that the Army War College has reported to the Secretary of War that the Swiss military system is not applicable to the U. S., and a similar report will probably be made on the Australian military system.

[The Fog of War—in Peace. By Capt. M. B. Stewart, U. S. Army. *Infantry Jour.*, July-Aug., '15. 7000 words.]

It is the business of army men to take things as they find them, and they are slow to talk about the military needs of the nation for fear—among other reasons—of being called alarmists. A casual remark by a civilian led to a discussion of the three factors presiding over the military destinies of nations—Situation, Relation, and Preparation. Soldiers, as agents whose business it is to carry out orders, were shown not to be responsible for our lack of preparation, and the query came, "Then why don't they get busy? What's the matter with them?" And the simple answer is "The Fog of War."

The Fog of War bears the burden of excuses for many costly mistakes. In time of war, mistakes of strategy, tactics and the like; in time of peace mistakes of military policy and preparedness. In war times, the fog of war is a tangible screen behind which are concealed belligerent operations; in peace time, it is an imaginary cloud invoked to obscure important issues of military policy. There is no fog of war in Europe today. Europe is confronted with a definite problem based upon the simplest principles and Europe without quibbling has cleared the foreground of everything not pertinent to the matter at hand. On our side of the water, we are temporizing and allowing ourselves to be led astray in a fog of our own making. The problem is the same, our day of reckoning is simply not yet here.

Nations, like individuals, need to learn by experience. Our wars have not made lasting impressions. Conditions have not been such as to convince us of the necessity of military preparedness. Brushing away the fog shows a simple matter of taking out a national insurance policy, or in other words exercising reasonable precautions and making use of sound business principles in carrying out constructive measures. We enjoy the biggest problems of commerce, finance, construction and extension. Magnitude serves as a tonic to our energies. Were it not for the fog of war, the problem of proper military policy would be but an incident in the nation's daily life. Another bogie man, as magnified, also dimmed by the fog of war—the menace of militarism. Our form of government is an effectual barrier to the introduction of such an evil. Irrespective of our condition of military preparedness, be it great or small, we cannot have war in this country unless the people so will it. Do not confuse military preparedness with militarism. To force militarism upon a republic is impossible; if a republic demands it, it cannot be denied to its citizens. War has attended every step of our development, so that our lack of preparedness does not save from wars. And yet the military establishment is supposed to incite wars!

Let us recognize one fact, *i.e.*, the people make or cause war. The army is a machine, absolutely inert, until the will of the people galvanizes it into action. Our army is composed of the same citizenship that furnishes our lawyers, doctors, artisans and laborers. A man by entering the service because he likes the vocation, is not changed. Why the fog of war about the soldier, a citizen of the soberest habits of thought and conduct? Why should this man want war? To a trained soldier there is little glory in war. A sense of duty carries him through its naked repulsiveness. Sweating, choking, starving days, reeking, troubled, sodden nights, a jumbled nightmare of toil and deprivation, facing the butchery that sends his next comrade, perhaps, to death—does this recall any pleasure to one who has been through it —does it look pleasant to those who study it? War to a soldier is a grim business, an impersonal performance of duty imposed upon him by his country. A civilian thinks of war impersonally, a soldier personally, and this latter knowledge cannot fail to carry with it a train of sober thought.

Another fog bank is one that has been dissipated not once nor twice but frequently, but which nevertheless forms the moment war's blast has ceased to blow, *i. e.*, geographical security. Miles are today reduced to feet, months to days by advances in transportation. Geography which once gave us comparative isolation to-day gives us a coast line

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such as no other nation is called upon to consider and to defend, and a breadth equal to either ocean when considered in the light of military transportation. We have created responsibilities beyond our former limits,—stubborn facts upon which the possibility or the advisability of war have no bearing. Our country was won for us; we hold it for our co-heirs as a trust. Military preparation, when it does not prevent war, is the best panacea for war. War does not fall hardest upon the actual participants but upon the women and children, upon the old and infirm. The shorter the war, the less the suffering.

The fog bank of expense is of no more substance than any other. Our soldier expects an adequate business return. The European is paying off a legal obligation. He does his own fighting, in America we hire our fighting. The people have chosen an expensive military system. One item—uniforms—eats up money upon money. Other larger items are the upkeep of expensive and unnecessary posts and the scattering of small forces over large areas, entailing expensive administration. It is the people's right to thus spend their money—but they must not balk at paying the fiddler. The great trouble in all this condition is the inability of the civilian brother and the military brother to understand each other. Once they do, the clear light of good common-sense patriotism will expose to view the fallacies of the Fog of War.

[Preparedness for War in the U. S. *Arms and the Man,* Aug. 5, '15. 350 words.]

Thoughtful Americans who have witnessed personally something of the present war are convinced of the necessity for preparation by the United States. A popular authoress is quoted as having interviewed Queen Mary of England and, though far from being a militarist, both are convinced of the folly of neglect.

America has now far more cause to fear the outbreak of war than had England in July of last year.

[How to Officer Our New Army. By W. G. C. *Army & Navy Jour.* Oct. 30, '15. 1000 words.]

(Outlines a plan to give a two years' course of military instruction to graduates of technical schools to supply the need of additional officers in case the army is largely increased. The plan would supply in four years all the officers needed if the army were doubled in size.)

[The War Department's Military Policy. Official Statement, from War Department. *Army & Navy Jour.* Nov. 6, '15. 2500 words.]

The necessity of preparedness and the possible plans are stated. The plan evolved contemplates foreign garrisons aggregating 1453 officers and 47,456 men (including 5733 Philippine Scouts), leaving a total combatant force on home stations of 66,968. Deducting Coast Artillery troops, the mobile home army would number 48,000. The entire authorized strength of the Regular Army would be 7086 officers, 50 veterinarians, and 134,707 enlisted men, calling for new organizations as follows: 10 regiments of infantry, 4 regiments of field artillery, 52 companies of coast artillery, 15 companies of engineers, and 4 aero squadrons. A Continental Army with an annual contingent of 133,000 men is proposed.

The ultimate annual cost will be:

Regular Army ...	141,843..	$127,234,559.70
National Guard ..	129,000..	10,000,000.00
Citizen Army ...	400,000..	45,000,000.00

Total strength of armed force, 670,843.
Total annual cost, $182,234,559.70.

[The Proposed Military Policy for the United States. By Lindley M. Garrison, Secretary of War. *Arms and the Man,* Nov. 11, '15. Reprinted in full.]

In proposing a military policy to be adopted at this time, the very first thing to do must be to agree upon the proper basis.

The subject could, theoretically, be approached without regard to existing constitutional and legal provisions and existing institutions and sentiments. Undoubtedly this method would result in proposals that would be sound from a military point of view and would theoretically approach perfection. The necessity of making such a system practicable, however, would require constitutional amendments, a reversal of existing institutions, and the changing of existing sentiments to such an extent as to make it a safe prediction that little, if anything, would be accomplished, and that only after the passage of a great length of time.

The other possible method of approaching the subject is one which recognizes constitutional and legal provisions, existing institutions, and the sentiments of the people in so far as they concern vital portions of the system.

As between the two methods of approach, it seems so clearly the part of wisdom to choose the one last stated as not to require elaboration of reason.

The essential, the imperative thing, is to make such wise military preparations and take such wise precautions as are presently possible. These reasons dispose of many suggestions which are entirely worthy of consideration from a military standpoint, but which could not be made effective under existing conditions. Military systems based upon universal military service, upon conscription, or upon national control of the public school system, fall under this head, as also does any policy which can only be made operative by a constitutional amendment or by identical, contemporaneous legislation in the forty-eight States of the Union. In any policy proposed, moreover, the matter of the cost of its maintenance has much to do with its acceptability, not that there should be any legitimate objection to the necessary expense of a proper policy, but that there would be legitimate objection to the

adoption of any policy which was unnecessarily expensive.

The policy proposed, therefore, proceeds upon the basis of existing conditions of a legal and constitutional nature and recognizes existing institutions and the feeling of the people concerning the general subject matter.

The Constitution provides that Congress may raise and support armies, and under that provision the regular standing Army exists. It likewise provides that Organized Militia may be maintained in the different States; that the national government may provide arms for this force, may decide upon the nature and character of its organization, and may prescribe the discipline to which it must conform. It reserves to the respective States the right to govern this force, to appoint the officers thereof, and to train it.

In time of peace this force is available to the President of the United States, under the Constitution, to aid in enforcing the laws of the Union, to aid in suppressing insurrections, and in repelling invasions. There is no constitutional provision which makes this force otherwise available to the nation in time of war, and therefore no law can be passed by Congress making it so available. In order to obtain whatever is possible to be obtained in this respect, the act of Congress concerning the raising of volunteers provides that such organized regiments of the National Guard as volunteer may be taken over into the service of the United States intact and not merely as individuals.

It will be seen, therefore, that under the Constitution there are contemplated two kinds of military forces—one a national force raised and maintained directly by the acts of the national Congress, and the other a force raised entirely by the States, to be governed, officered and trained by them and to be available to the national authorities in certain specified instances.

If the determination arrived at by those whose knowledge, skill, and experience makes their judgment practically conclusive is accepted, we should have in this country a force of at least 500,000 men ready for instant response to a call in the event of war or the imminence of war. It is surely not necessary to state the many reasons why this force may not be supplied by a regular standing army of that number constantly under arms. For reasons which have just been pointed out it is equally impracticable to suggest that this force should consist solely of the National Guard expanded to that number. There is no legal way that the National Guard can, in time of peace, be governed, officered, or trained by the National Government and there is no legal way, excepting by volunteering, that it can be made available to the nation in time of war to any greater extent than specified in the Constitution, which confessedly falls short of the necessary uses to which an army may have to be put in the event of a war with a foreign nation.

It becomes necessary, therefore, to devise some method of making available for the use of the nation in time of war a national force in supplement of that part of the national force, to wit, the Regular Army, which is constantly under arms; a part of the Army, in other words, to be raised and maintained by Congress and governed in all respects in accordance with its directions. When this system is devised and made operative the nation would militarily be in this situation: It would have, as the Constitution provides, an Army raised and maintained by it, composed of a certain number constantly under arms, and a very much larger number definitely identified in personnel, provided with equipment and organization, possessed of some training, and subject to instant call. The States would have the Organized Militia, developed with Federal assistance to the highest practicable point of efficiency, available for the purposes specified in the Constitution, and so circumstanced that in the event of a war with a foreign nation they could, by their own volition, immediately take their place with the other military force of the nation.

Having reached these conclusions, we approach the question of their practical application.

Our military responsibilities include not only continental United States, but also the Philippine Islands, Hawaii, Porto Rico, and the Panama Canal. On the military side, as distinguished from the naval side, there is necessity for provision not only for mobile army troops—that is, infantry, cavalry, and field artillery—but for coast fortifications and troops to man them.

At the present time appropriations are available for the maintenance of an Army and all of the accessory employes thereof aggregating 5023 officers and 102,985 enlisted men. Of these 67,000 men are mobile army troops, 20,000 are coast defense troops, and the balance are hospital corps, quartermaster men, and other employes of that character. Of this total number, about 29,000 are on service outside continental United States, leaving therein about 46,000 mobile troops and about 13,000 coast defense troops. Deductions must be made from these latter figures of sufficient troops to garrison the over-sea possessions, which will materially reduce each of the totals above mentioned.

The Organized Militia in the various States has an enrollment of approximately 129,000 men and officers.

The policy as proposed provides for the over-sea garrisons in accordance with the approved plan of 1913, and for the presence in continental United States of approximately 50,000 mobile army troops and 20,000 coast artillery troops, together with the necessary auxiliary troops, etc.

The total of the enlisted men and officers in the Regular Army, when the plan has been completely carried out, would be 141,843.

It is proposed that the term of enlistment in the Regular Army shall be two years with

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the colors and four years on furlough, during which latter period the obligation would be to return to the colors in the event of war or the imminence thereof. Under this scheme there would always be in the country a large number of men who had been trained in the Regular Army and who, during the period mentioned, would be subject to the call of the Nation to be placed in the Regular Army or to be held in reserve to supply wastage or to be utilized in whatever way was thought best.

The plan necessitates the raising of the following additional organizations and proposes to do this in two fiscal years, one-half in the next fiscal year and the other in the succeeding one:

Ten regiments of infantry, 4 regiments of field artillery, 52 companies of coast artillery, 15 companies of engineers, and 4 aero squadrons.

It is not now proposed to attempt a rearrangement of Army posts. However undesirable from a military standpoint the location of some existing posts may be, they do exist and can be utilized, and, in fact, will all be necessary if the increased force is provided. The essential thing at this time is to obtain the requisite men and matériel, and it is relatively unessential where we house them. It seems the part of wisdom, therefore, not now to ask for money to acquire, erect, and equip new places when the existing ones can be used, and furthermore will be available in great degree, for the training of the supplement of the standing army, which is a part of the plan.

It is proposed to supplement the Army that is constantly under arms by a force of 400,000 men raised in increments of 133,000 a year, obligated to devote a specified time to training for a period of three years, and then to be on furlough for a period of three years without obligation excepting to return to the colors in the event of war or the imminence thereof. For the purpose of convenience this force has been designated the Continental Army. It is proposed to recruit it territorially according to population; to have it subjected to short periods of intensive training; and in addition to what officers may be developed from its own operations, to obtain officers for it from those who have served in the National Guard, those who have served in the United States Army and are no longer upon its active list, and those who, by training acquired in colleges and schools or in other ways, have become equipped with sufficient military information and experience to make them available. It is the purpose to have the membership of this force assembled at convenient places and have there such portions of the Regular Army to assist in their training as are desirable, and to obtain all the benefit which can be obtained from intensive training over such a period of time as is possible. For the purposes of the necessary figuring upon costs, etc., as well as for military reasons, the period proposed is two months. It is recognized, however, that with respect to this period of training and other features of the plan a final wise determination can only be reached after the fullest interchange of views between those who collectively represent the wisdom, experience, and knowledge to determine these matters properly.

With respect to the National Guard, it is proposed not only to continue the existing assistance rendered by the Federal Government, but to increase it. In the references previously made to the National Guard, the relationship of that body to the military system of the country was stated. With the existing co-operation of the Federal Government and the earnest efforts of the membership of the Guard, great progress has been made in the last decade and, in the judgment of all those concerned, still greater progress is not only possible but assured. There is the fullest recognition and appreciation of the untiring devotion and patriotic spirit of those who have unceasingly wrought for the improvement of this body. This body has, as above stated, a clearlv defined and important part in the military system of the country, and it is proposed in the plan advocated to amplify the Federal assistance in every way that it can be done constitutionally, so as to aid this force and make it efficient for the purposes set forth in the Constitution, and for the further purpose for which it is available in the event of war if it volunteers for Federal service. The plan offers to the membership of the National Guard every alternative which a full recognition of their position suggests. With respect to the National Guard system, under the Constitution there is to be not only continued but increased Federal co-operation and assistance. With respect to the personnel of the Guard, opportunity is offered, either in units or individually, to come into the Continental Army whenever by the action of their State they are free to do so.

From this outline of the policy it will be observed that it has been framed in view of existing legal and other conditions. It provides for a standing Army of the minimum size to perform the necessary functions of such a force, including the very important one of training the other military forces. It provides a supplement to that Army into which the citizens of the country who realize the necessity of patriotic action on their part can go with a minimum sacrifice. It continues available for all its legal purposes the other force outside the National Army, and provides for increasing co-operation therewith. It offers opportunity to the three great classes of the community that are considered available for military purposes in so far as training and preparation in time of peace are concerned, namely, those who will undertake regular service, being constantly under arms; those who desire to prepare themselves but cannot take such preparation in intensive periods; and those who are so circumstanced

that the intensive training best meets their conditions.

Both with respect to the Army that is constantly under arms and the Continental Army, its supplement, there is no request for sums of money to build or provide accommodations therefor. The policy seems to come as nearly as is possible to meeting the conditions which must be met in a country which does not provide for universal military service or for compulsory military service, and does offer an opportunity to solve the military problem along the line of the patriotic spirit and conduct of its citizenship.

The framers of the policy are fully conscious of the possibility of formulating military policies much better in theory, but after concentrated consideration of existing legal and other conditions they think it will be found that almost insuperable objections and difficulties arise in carrying into practical operation suggestions that from the military standpoint might otherwise be very acceptable.

This completes consideration in so far as the personnel of the proposed policy is concerned, and leaves for consideration the questions of reserve matériel, coast defenses, and other subjects not properly part of a formulated policy with respect to prepared forces.

For the purpose of ascertaining the requirements with respect to the coast defense fortifications, the Secretary of War some months ago created a board composed of the heads of all departments having to do with this subject matter. Space and other considerations made it undesirable to go into the matter as reported upon by them, in detail; it is sufficient to say that they have given the entire subject full consideration, aided by reports and suggestions of those on the ground and familiar therewith. Under their instructions they were to report upon any needed fortifications at places where they do not now exist, any change at existing fortifications, and any supplements thereto. They have prepared elaborate reports covering all these points and have suggested a total expenditure during the next four years of $80,000,000 in annual increments of $20,000,000 each.

In similar manner the heads of the various departments which have to do with equipment and supplies have studied the situation with a view to ascertaining what matériel should be on hand for use by a force of 500,000 men in addition to what would be in their hands at the outbreak of hostilities. The result of this study was an aggregate of approximately $104,000,000, to be accumulated throughout the period of four years by the expenditure annually of $26,000,000.

Many other subjects have been studied and provision made with respect to them which cannot usefully be dwelt upon in this statement. With respect to such important subjects as aviation, its equipment and personnel, the necessity for large guns which may be moved from place to place, field guns and machine guns in sufficient quantities, coast defense guns of proper size, proper reserves of ammunition for all arms, and motor transportation, careful study has been devoted to the consideration thereof, and the recommendations to be made are the results of the best thought and experience with respect thereto.

It has been proposed to make available in time of need the services of those in certain kinds of employment requiring special knowledge and skill, such as railroad men, bridge builders, engineers of all descriptions, etc., and leading men in these lines and professions have been collaborating with the War Department in an endeavor to formulate, by legislation or administrative action, an acceptable and useful plan with respect thereto. In this connection, and because of the patriotic spirit thus displayed, it seems desirable to say that if those who are the employers of the young men of the country cannot, by reason of age or situation in life, give their personal service, they can do that which will be equally useful, by encouraging in every way the participation of those in their employ in the plan of national defense. If they would so arrange their business that a certain proportion of those whom they engage could undertake this national service without sacrificing their personal interests, those who did this thing would be acting in the most public-spirited and patriotic manner possible.

What follows with respect to the details of numbers, organizations, and cost completes this outline of the proposed policy.

Under this plan there would be stationed the following totals of officers and enlisted men at the following places:

	Officers	Enlisted Men
Panama Canal Zone	272	9490
Hawaiian Islands	503	16,869
Philippine Islands	448	14,324
Philippine Islands (P. S.)	182	5733
Porto Rico	32	599
Alaska	16	441
Total over-sea garrisons	1453	47,456

In continental United States there would be the following organizations aggregating the following totals of officers and enlisted men:

	Officers	Enlisted Men
11 2-3 regiments of cavalry	597	11,973
26 2-3 regiments of infantry	1361	25,512
7 regiments of field artillery	308	6599
170 companies of coast artill.	510	18,968
Engineer troops	104	3262
Signal troops	76	654
Total at home, combatant forces	2956	66,968
Mobile Army, deducting coast artillery	2446	48,000

In addition to the above, there are at home and abroad 1927 officers of the staff departments and extra officers provided by law, and fifty veterinarians. The plan calls for 750 more officers for the proper execution of this plan, involving as it must, the training of the

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citizen soldiers, and more co-operation with the National Guard and with those educational institutions which have military courses.

In addition to the enumerated forces in the Regular Army, there must be provided a total of 20,283 men for the quartermaster corps, hospital corps, ordnance department, recruiting service, school detachments, etc., including 792 additional non-commissioned officers to aid in training the citizen soldiers.

Thus, the total of the officers and enlisted men in the Regular Army, as proposed above, at home and abroad, will be:

Officers	7086
Veterinarians	50
Enlisted men	134,707

To obtain this result, the plan calls for the following new organizations:

Ten regiments of infantry, 4 regiments of field artillery, 52 companies of coast artillery, 15 companies of engineers, and 4 aero-squadrons.

Using reserve matériel as far as available to equip new organizations, the estimated cost of the Regular Army on the proposed plan of 7086 officers, 50 veterinarians, and 134,707 enlisted men will be $127,234,559.70. It is proposed, however, to provide for the additional organizations in two annual equal increments, so that the first year the cost of the proposed Army would be $111,035,716.08. To this must be added for the first year's cost the cost of cantonments at over-sea garrisons, amounting to $600,000, making the total for the first year $111,635,716.08.

At the present time the Federal Government appropriates for or on behalf of the National Guard an average of $6,614,532.13 annually. The States individually appropriate for their respective Guard an aggregate of $6,244,214.98 annually. It is proposed this year to increase the Federal appropriation to $10,000,000.

Using reserve matériel to the extent available for the personal accouterment of the citizen soldiers and not furnishing them with full complement of wagon transportation, horses for cavalry, etc., it is estimated that the cost of the first year, when 133,000 men are to be trained, will be approximately $15,000,000; the second year, when an additonal 133,000 are to be trained, the cost will be approximately $29,500,000; and the third year, when the whole 400,000 will be under training, the cost will be approximately $45,000,000, and this will be the annual cost of the system when in complete operation.

The first year the estimated items of cost would be as follows:

For the Regular Army	$111,635,716.08
For the Citizen Army	15,000,000.00
For the National Guard	10,000,000.00
Total	$136,635,716.08

When the system is in complete operation, without considering reserves of the different organizations, the results as to numbers and cost would be as follows:

	Officers and Enlisted Men	Total Cost
Regular Army	141,843	$127,234,559.70
National Guard	129,000	10,000,000.00
Citizen Army	400,000	45,000,000.00
Total	670,843	$182,234,559.70

With respect to reserve matériel:

In addition to the matériel in the hands of the Regular Army, the National Guard and the Citizen Army, already provided for in previously stated estimates, there should be provided and kept in reserve matériel of the kind which cannot be obtained with reasonable promptness, as follows:

Quartermaster material	$19,474,390.97
Ordnance material	74,582,237.85
Medical supplies	716,423.81
Signal material	7,530,928.45
Engineer material	2,022,280.00
Total	$104,326,261.08

It is deemed best to provide for this accumulation in four annual increments at the annual rate of $26,081,320.

SEACOAST FORTIFICATIONS

The board before mentioned reported an irreducible minimum for additional seacoast defenses, necessary accessories, and an adequate reserve of ammunition, totaling $81,677,000, of which there would be used:

In continental United States	$60,540,000
Over seas	21,137,000

This board estimates that appropriations can be expended to the greatest advantage at an annual rate of approximately $20,000,000, thus completing the work in four years.

If these requirements are met, the results would be as follows, so far as cost is concerned:

For the first year:	
For the personnel, etc., of the Regular Army, National Guard, and Citizen Army	$136,635,716.08
For reserve matériel	26,081,320.00
For seacoast defenses	20,000,000.00
Total	$182,717,036.08
For the second year:	
For the Regular Army	$127,234,559.70
National Guard	10,000,000.00
Citizen Army	29,500,000.00
Reserve matériel	26,081,320.00
Seacoast defenses	20,000,000.00
Total	$212,815,879.70
For the third and fourth years:	
Regular Army	$127,234,559.70
National Guard	10,000,000.00
Citizen Army	$45,000,000.00
Reserve matériel	26,081,320.00
Seacoast defenses	20,000,000.00
Total	$228,315,879.70

Annually thereafter:

Regular Army	$127,234,559.70
National Guard	10,000,000.00
Citizen Army	$45,000,000.00
Total	$182,234,559.70

See also
American Legion
Army—Organization—Swiss-Australian system
National Guard (U. S.)
United States—Compulsory military service
United States—Militia

—Military Policy of—Committee on National Preparedness

[Conference Committee on National Preparedness Organized. *Flying*, July, '15. 1200 words.]

A committee under the foregoing name has been organized, representing the Army League, the Navy League, the National Security League, the Aero Club of America, etc., nine in all.

The purpose of this committee is co-operation with the National Government, through the War and the Navy Departments, to remedy the National unpreparedness of this country.

—Military Policy of—Students' Summer Instruction Camps

[Public Fealty. By Capt. C. Nixon, 30th Infy. *Infantry Jour.*, May-June, '15. 1800 words.]

The United States is a commercial power, due to the fact that American captains of industry have learned that efficiency is the synthesis of their economic virtues. These men do not broaden their field of sales, lower their cost of production, etc., and fail to allow a stipulated sum for depreciation or omit the fire insurance. A republic is a composite citizen. National defense is a protective or insurance measure. Preparation for hostilities is a protection against unavoidable causes of war. A knowledge of military policy is an insurance against avoidable wars.

Our neglect of national insurance is best made a fundamental responsibility of the college trained young man. The older man engrossed in life's pursuits has not the time or inclination. The young man grasps, at an impressionable age, and under true governmental instruction the lessons of the national and commercial dangers of war. The opportunity to study briefly this phase of national fealty is offered by the students' summer instruction camps. At a very nominal cost for food and board the young man on his vacation from college learns the real history of our raw resources. It will surprise him to know that the troops around Boston during the Revolution, refused to serve a few days overtime and ended by deserting, in the face of opposing British troops. He will learn the military policy, meager as it is, also the safeguards in camp sanitation—habits of precaution simply which required the Spanish War and hundreds of lives to bring to perfection. He will learn camping, building fire quickly, shooting, marching, map reading, road sketching, etc., from officers expert in their respective branches, and all the while he is better equipping himself physically and storing up stronger incentives to renew his studies.

Neglecting 50% as unable to attend for one reason or another, the country has 20,000 young men available each year. This is a field worthy of national effort. The educated young men, with their broader conception of national responsibility, will be leaders of true caliber for that highest duty of a citizen—national defense.

—Military Schools

See
United States—Army—Schools and training

—Militia

[A Citizen Soldiery Trained and Accustomed to Arms. By Moses King, Jr. *Seventh Regiment Gazette*, Jan 1915. 1400 words.]

Under modern conditions we have no citizenry accustomed to the use of arms. Modern war requires of soldiers more than mere loyalty and bravery. These must be supplemented by training.

The organized militia numbering 116,000 officers and men, is not a solution of the problem. Compulsory service in the organized militia is the one way to accustom the citizen body to the use of arms.

Three years of service between the ages of 18 and 25, with 30 drills and 10 days in camp each year, would offer an opportunity for the necessary instruction. Those receiving military instruction in schools and colleges should be exempt.

Such period of service would be no great hardship, and the disciplinary training would be valuable in after life.

See also
American Legion
National Guard (U. S.)
United States—Military policy of
United States—Army—Reserve

—Militia—Officers for

[How to Officer Our Volunteers. Anon. *Army & Navy Jour.*, July 17, '15. 750 words.]

In considering plans for volunteer forces, the General Staff realizes that about the only systematic way that the necessary officers can be trained is through instruction at the agricultural and mechanical colleges supported under the Morrill Act, an auxiliary source being the high class military schools. At the land grant colleges there are about 30,000 students under military instruction. An increased number of regular officers at these colleges would provide the necessary instruction. We need 40,000 reserve officers. Some of the details by which the necessary degree of instruction could be given are set forth. It is suggested that an opportunity might be offered students of military schools to serve a year in the Regular Army as 2nd Lieutenants.

—Militia—Organization of

[A Plan of Militia Organization. By Maj. C. E. Lydecker. *Seventh Regiment Gazette*, Feb 1915. 1900 words.]

UNITED STATES—Continued

Every citizen should be given elementary instruction as a soldier, and the state should exact some duty from him.

Each state should be divided into military districts, and all citizens between the ages of 18 and 45 should be enrolled in three classes. The First Reserve (18 to 25) should attend six times yearly; the Second Reserve (26 to 35) three times; and the Third Reserve (36 to 45) once. Exemptions should be made for proper cause, among others service in the organized militia.

The elementary military knowledge should be acquired by study and practice of the individuals, the yearly attendances being inspections to see that the prescribed work had been done.

—Munitions—European War Orders for

See

EUROPEAN WAR—MUNITIONS—ORDERS FOR IN UNITED STATES

—Munitions—Manufacturing Capacity

See

MUNITIONS—MANUFACTURING CAPACITY—OF UNITED STATES

—Navy

[The Navy's New Battleships. *Army and Navy Jour.*, Sept. 18, '15. 400 words.]

Contract plans for the latest battleships authorized for the U. S. Navy show them to be ships 624 feet over all; beam 97 ft. 8 in.; draft 30 ft.; speed 20½ knots; displacement about 32,000 tons; main battery twelve 14-inch guns; secondary battery 22 5-inch guns.

[Destroyer and Submarine Awards. *Army & Navy Jour.*, Oct 23, '15. 700 words.]

Preliminary awards of contracts for six destroyers and sixteen submarines were made on Oct 18 by the Secretary of the Navy.

[Navy Estimates for 1916-17. *Army & Navy Jour*, Oct 23, '15. 1200 words.]

The Secretary of the Navy has recommended to Congress a five-year naval program calling for 10 battleships, 6 battle cruisers, 10 scout cruisers, 50 destroyers, 15 fleet submarines, 85 coast submarines, 3 gunboats, and 6 auxiliaries, at a grand total cost for new construction of just over $500,000,000 in the five years.

See

AERONAUTICS—UNITED STATES

BATTLESHIPS—COMPARATIVE POWER OF "PENNSYLVANIA"

—Navy—Chief of Naval Operations

Rear Admiral Bradley A. Fiske, U.S.N., aid for operations of the Navy Department, placed his resignation of that detail in the hands of the Secretary of the Navy Apr 1.

Secretary Daniels on Apr 28 announced the selection by President Wilson of Capt. William Shepherd Benson as Chief of Naval Operations, an office created by Congress at its previous session. At the same time, Secretary Daniels announced that Admiral Fletcher would continue indefinitely in command of the Atlantic battleship fleet. This probably means that Admiral Fletcher will remain the chief fleet commander until his retirement in 1917. When Capt. Benson took up his new duties on May 3, the office of Aid for Operations, which had been held by Rear Admiral Bradley A. Fiske, went out of existence. This office existed only by Executive order and regulation, while the new office of Chief of Naval Operations, which is expected to grow into the most important professional office in the Navy Department and the most powerful, owes its existence to statutory enactment.

Secretary Daniels announced that Rear Admiral Fiske would be assigned to duty as a staff officer at the Naval War College at Newport.

Secretary Daniels made public the text of the new navy regulations governing the office of Chief of Naval Operations. These were approved by Admiral Dewey and Rear Admirals Badger and Fiske, to whom they were submitted. The regulations follow:

1. The Chief of Naval Operations shall, under the direction of the Secretary of the Navy, be charged with the operations and readiness of plans for its use in war. (Act of March 3, 1915.)

2. This shall include the direction of the Naval War College, the Office of Naval Intelligence, the Office of Target Practice and Engineering Competitions; the operation of the Radio Service and of other systems of communication, of the Naval Defense districts and of the Coast Guard when operating with the Navy; the direction of all strategic and tactical matters, organization, manoeuvres, target practice, drills and exercises and of the training of the fleet for war, and the preparation, revision and enforcement of all tactical drill books, signal codes and cipher codes. The orders issued by the Chief of Naval Operations in the performance of the duties enumerated in this paragraph shall be considered as emanating from the Secretary of the Navy, and shall have full force and effect as such.

3. The Chief of Naval Operations shall be charged with the preparation, revision, and record of regulations for the benefit of the navy, naval instructions, and general orders.

4. He shall advise the Secretary concerning the movements and operations of vessels of the navy and prepare all orders issued by the navy in regard thereto, and shall keep the records of service of all fleets, squadrons, and ships.

5. He shall advise the Secretary in regard to the military features of all new ships and as to any proposed extensive alterations of a ship which will affect its military value, and all features which affect the military value of dry docks, including their location; also as to matters pertaining to fuel reservations and depots, the location of radio stations, reserves of ordnance and ammunition, fuel, stores, and other supplies, with a view to meeting effectively the demands of the fleet.

6. In preparing and maintaining in readiness plans for the fleet in war he shall freely consult with and have the advice and assistance of the various bureaus, boards, and offices of the department, including the Marine Corps Headquarters, in matters coming under their command. After the approval of any given war plans by the Secretary, it shall be the duty of the Chief of Naval Operations to assign to the bureaus, boards, and offices such parts thereof as may be needed for the intelligent carrying out of their respective duties in regard to such plans.

7. The Chief of Naval Operations shall, from time to time, witness the operations of the fleet as an observer.

8. He shall have as senior assistant an officer not below the grade of Captain.

9. He shall ex-officio be a member of the General Board.

10. During the temporary absence of the Secretary and Assistant Secretary of the Navy, the Chief of Naval Operations shall be next in succession to act as Secretary of the Navy. (Act of March 3, 1915.)

—Navy—Submarines

See

SUBMARINES—UNITED STATES

—War Department—Civil Functions of

[The Civil Functions of the War Department. By Capt. Geo. H. Shelton, 29th Inf., U. S. A. *Jour. Military Service Inst., U. S.*, Mar-Apr, '15. 9500 words.]

The discussion, by a considerable part of the service at large, prior to publication, and by the authority of the War Department, of the report of the General Staff on the organization of the army, 1912, marks a liberal tendency which makes for the good of the army.

The War Department, like the whole military establishment, is the result of over a century of piecemeal development, tending, until recent years, to the aggrandizement of separate bureaus, without much thought of the department as a whole. In framing the report of 1912, the committee neglected all other functions but "the strictly military duties of the department." With these "other functions" this article has to deal.

The War Department is much more than a war office. It is charged with very extensive and enormously important civil duties, many of which are enumerated. Are these a necessary part of the department?

The Secretary of War, carrying this great burden, and being a civilian, naturally feels more at home in the conduct of the civil than in the military features of his duties. Civil problems, affecting the present, seem most important, while, to the civilian mind, military problems are for the future and may be deferred.

The War Department was originally created for the conduct of military and naval affairs, and the civil functions are accretions of time, and now threaten to crowd the purely military functions to the wall. In fact, no other department of the government has received additions of so great importance, and many of these have come in very recent years.

The army largely feels that if the Secretary of War could give untrammeled attention to the army, as the Secretary of the Navy does to the navy, progress would be more satisfactory and order brought out of the chaos that is now recognized to exist.

It is difficult always to draw the line between military functions and those purely civil. Certain it is that the department should not be one of public works. As concerning rivers and harbors, for instance, navigable rivers and nearly all harbors might assume immediate military importance. Hence the apparent necessity for control by the Secretary of War. Evidently some are very important militarily, yet others so unimportant as to render their military control an absurdity. Inasmuch as the War Department exercises control in time of peace over only certain reservations for military purposes along the shores, why should the entire body of water be so controlled? In case of war harbors can be as readily mined if they are under some other department, and there appears no other military reason for their present system of control. In other words, the nation's military interests are little more dependent on War Department control of navigable waters than upon the control of the weather bureau, which was formerly so administered. Certain of these responsibilities fell to the War Department as a matter of custom, probably because they were honestly and efficiently conducted. But this is an excuse and not a reason for continuance. This argument would favor the transfer to the War Department of every form of governmental activity, and indeed some of these activities, as, for example, the geological survey and related functions, are of great importance militarily, yet are being well administered under other departments.

Custom has determined the retention in the War Department of river and harbor work. West Point was the greatest engineering school in the country for a long period, and naturally the engineers for Government works were taken from its graduates. Since the Civil War, with the development of other engineering schools, this necessity has disappeared, but the practice still obtains of assigning to the Engineer Corps of the Army more than enough graduates to take care of the military duties of the corps, to the detriment of other branches of the service that need educated officers. The necessary result of the system is to charge against military expenditures money used for civil purposes, and the consequent result is to bring the purely military branches of the service into disrepute, not only on this account, but by making the duty of these officers more attractive than other classes of duty.

The construction of military posts, installation of harbor defenses, &c., are military projects. But why the Panama Canal? It has been urged that the experience gained by the army engineers in river and harbor work was the reason for their selection for the canal. This is not necessarily the case. But even so, this does not affect the purely military aspect of the canal problem. So far as the actual construction of the waterway was concerned, there has been no direct military advantage in having it done by the army, but the moment it is completed it becomes an important military and naval asset, and its military use may at any time rise superior to its commercial. Indirectly there has been an advantage in all military control since there has been a continuity of policy and effort in the construction of the canal and its fortification, and of course the fortification was entirely outside of civil possibilities. The success of the engineering features of the canal cannot be attributed to the fact that West Point is the leading institution for civil and military engineering—for there are other equally good engineering schools—but to the habits of discipline inculcated by army service. In other words, the very fact that an army is fitted to perform certain civil or semi-civil duties in peace is dependent on the qualities that fit it for war, and as soon as the development of these qualities begins to be neglected, an army becomes not only less fitted for civil duties but wholly unfitted for war. And

from these considerations may be deduced the principles: 1st, The War Department should be charged with every direct military function of the Government; 2d, it should not be charged except temporarily in an emergency with purely civil functions; and 3d, it should never, under any circumstances, be charged with civil functions likely to influence adversely its organization or training for war.

In insular matters the War Department has exercised control over vast territory and at times over a population amounting to one-tenth that of the United Sates. The ramifications of its activities are as numerous as the various departments of any Government can reach. Not only this, but many of the problems presented were entirely new, and required much original thought by the directing head, entailing enormous labor. Eminent authorities have frequently suggested the transfer of these functions to another department, but, when all the points of view are considered, this seems unwise. Were it a burden that could be shifted without injury to military interests, its transfer would be wise, but a careful consideration shows that such is not the case. The various insular possessions fell to the United States by military occupation. The deposed governments had, of necessity, to be replaced by military rule temporarily. Congress was able to replace in a measure the purely military governments by ones more completely civil, though not entirely. The problem of defense of these outlying territories has more or less unconsciously affected the status of the governments therein. This has been the experience of all colonial powers, except that, with England, the vast extent of the colonies has made necessary a separate department of government, but until our colonies are equally extensive, our War Department should exercise control as a vital factor in national defense. This accords with the first of the above mentioned principles, and does not violate the second; nor, indeed, does it violate the third, for the insular possessions have never affected the military forces adversely.

Other civil functions, not herein mentioned, should be tested according to these principles and retained if not violating them, but if these cardinal principles are violated, then such duties should be taken by another department.

URUGUAY

—Compulsory Military Service

[Project for National Defense, from "El Dia de Montevideo." *Revista Militar, Argentine Republic,* Apr, '15. 3300 words.]

Project of the Deputy W. Paullier. Contemplates compulsory service of all able-bodied men; they should serve with the active army from 20 to 21. This would give 6000 men to be incorporated each year. With the 7000 or 8000 professional soldiers, this would give an active army of 13,000 or 14,000 men.

The project reckons that there will be 150,-000 reservists available; men between the ages of 17 and 50 years.

It is proposed to have 50 batteries of 4 75 mm. guns each.

There would be available for defense, under this project, 186,000 men, 284 guns, a corps of military aviators, and fortifications, mines, submarines, and destroyers for the defense of the coast.

VERA CRUZ—U. S. operations at in 1914—Work of Sanitary Service

[Sanitary Work of the Army at Vera Cruz. By Col. H. P. Birmingham, Med. Corps, U. S. Army. *Military Surgeon,* Mar 1915. 7200 words.]

The expeditionary force disembarked at Vera Cruz April 30, 1914. Due to the disorganization of the city government, sanitary conditions were not favorable. Immediate sanitary measures included disinfection of floors and walls of buildings occupied by troops; screening of messes and kitchens; the administering of quinine; and a general clean-up of the city. All troops had been protected against typhoid and smallpox.

Sanitary regulations were published covering the disposal of garbage, manure from the picket lines and excreta, the screening of kitchens and mess rooms, installation of shower baths, use of mosquito bars, and warning against certain foods.

The sick rate was no greater than at home stations. The most prevalent forms of disease were (a) dysentery, which was checked by a vigorous campaign against the fly; (b) malaria, which led to extensive anti-mosquito work; and (c) venereal disease, against which appropriate measures of inspection and prophylaxis were taken.

The activities of the Medical Department also included building regulations (from a sanitary standpoint), management of public charities, statistical work, and laboratory services.

VERMIN EXTERMINATION

[Typhus Fever Cases and Methods of Killing the Lice. By Adler-Herzmark (Jenny). *Militärarzt,* Wien, '15. 2500 words. Illus.]

Author reports three (3) cases of typhus fever, and the methods of lice-killing, with 3 cuts and 1 plate. The hospital is No. 6, in Vienna. The arrangement for lice extermination is in the cellar of the hospital.

The man is brought from the street, down the steps into a reception room. His arms are taken from him, sprayed with a disinfectant, and removed to another room. From this room soldiers proceed through separate doors into the undressing-room, on the walls of which are hooks, with open sacks, sprayed with lysol or sublimate; each sack receives a soldier's accoutrement and clothing for disinfection.

From room 2 he goes into room 3, the barber-shop, where his hair and beard are removed into an iron box, to be burned. From here the man steps into 4, the bath-room; here are arrangements to regulate the temperature, and the entire body and feet are showered heavily. The space for showering is separated from the remaining bath-room, and its floor is cemented. To the right are four bath tubs with arrangements for badly

wounded extremities. To the left of centre are adaptations for severely wounded. To the extreme left are 2 baths for those suspected of infection. The soldiers are cleaned by a brush and the following mixture: 2 pts. soft soap, 1 pt. petroleum, 1 pt. lysol-solution. On the hairy part a 3 per cent. cresol ointment is rubbed. From here the man is taken to room 5, the examination room, containing an examination table, a case of instruments and bandages, 1 wash-table with warm-water arrangements, and another wash-table for sublimate. Everything is white enameled; while the examination table is covered with a linen cloth. From here he is taken to room 6, where there are boxes with clean linen, hospital gowns and slippers. From here he steps into room 7, the reception room, where his name is entered on a card, and a personal card is handed to him. From here by set of stairs he is taken to the hospital proper.

We now return to the sacks of clothing, etc., left in room 1. These are numbered, closed, and taken to sulphur or formalin-chambers. There is a large and small sulphur chamber. The large one is 170 m^3, with many closed windows. There are many wooden compartments here to receive pieces from the sacks and the sacks themselves. On the right wall is Grassberger's apparatus for sulphur burning; the sulphur is in iron grooves, alcohol is poured on it, and it is ignited. The sulphur fumes act for 9 hours, after ignition, upon articles in that room. The vapor is then removed by an electric ventilator, and formalin-disinfection is substituted. Then the articles are put back into the sacks.

The room is so big that hospital belongings are also disinfected there.

The linen is now taken to laundry and washed. There are tailors and shoemakers in this department so that when the soldier leaves the hospital, his clothing and accoutrement are handed to him in complete repair.

VILLAGES

—Fortifications of

[The Problem of the Fortified House. *Sphere,* Aug. 21, '15. 500 words. Illust.]

Villages offer a conspicuous target for artillery and are in this respect unsatisfactory for defense. They have two great advantages —they afford shelter from the weather, and they conceal the strength and disposition of the garrisons. In time a village can be made almost impregnable against anything but the heaviest artillery fire. Sand bags, plenty of barbed wire, and plenty of machine guns are the things essential for preparation for defense.

VOCABULARY, MILITARY

France

—English Translation of

[French Military Expressions Difficult to Translate Exactly into English. By G. N. Tricoche, late Lieut. French F. A. *Field Artillery Jour.,* Apr.-June, '15. 600 words.]

Adjudant=Serg. Major, or chief of platoon (artillery).

Adjudant-major=Adjutant.

Adjudant-chef=Ranking n.c.o. in the army.

Artificier=Does not mean mechanic but an expert in explosives (obsolete).

Bataillon=Infantry battalion.

Groupe=Battalion of field artillery.

Brigadier=Corporal in mounted organizations, a brigadier general is *Général de Brigade.* [*Général de brigade*=major-general.—Ed.]

Infirmier=Sanitary private.

Brancardier=Litter bearer.

Maréchal des Logis Chef=First sergeant.

Maréchal des Logis=Sergeant in mounted troops.

Maréchal-ferrant=Farrier.

Musicien=Member of a band.

Officier d'ordonnance=Aide de camp.

Ordonnance=Striker. [Orderly.—Ed.]

Planton=Orderly; messenger.

Section=Platoon (artillery).

Sous-officier=Non-commissioned officer.

VOLUNTEERS

See also
Militia

VON HINDENBURG, Field Marshal General Von Beneckendorff u.

[Von Hindenburg, General and Man. By William C. Dreher. *Atlantic Monthly,* Aug., '15. 7000 words.]

Gen. von Hindenburg was favorably known in higher army circles prior to the war in Europe; and was known where he had served as an agreeable man with a high reputation for military capacity. He sprang suddenly into fame by defeating the Russian Narew Army of five corps in the battle of Tannenberg late in August, 1914. Von Hindenburg was living in retirement at Hanover when the war broke out. He tendered his services and on August 22 was placed in command of the Eastern Army. He knew the topography of East Prussia thoroughly and three days later began the battle of Tannenberg which made him famous. In this battle the prisoners captured exceeded 90,000. Within six months after he assumed command of the Eastern Army he had captured a half million prisoners and inflicted on the Russian armies casualties of about equal number—an unparalleled achievement in war.

Gen. von Hindenburg (von Beneckendorff und von Hindenburg) is twice a nobleman, but is also a soldier pure and simple. He comes from a family of soldiers and has devoted his whole life to the military profession. He attended a private school at Glogau a few years, then a cadet school at Wahlsatt in Silesia. In 1864 he was a pupil at the chief Cadet House in Berlin, too young to go into the war.

In 1866, then 18½ years old, he received a commission as a lieutenant and at once joined the army, participating in the battle of Königgrätz, where he was slightly wounded. He served through the Franco-Prussian War, and was in action at St. Privat, Sedan, and the siege of Paris.

VON HINDENBURG—Continued

Two years later he was at the War Academy in Berlin. A quiet earnestness was considered his leading characteristic by his professor.

For the forty years after the Franco-Prussian War, von Hindenburg worked away quietly at his military education, rising from one post of responsibility to another. In 1881-83 he was a division staff officer at Königsberg when he began his studies of the Masurian Lake region. In 1886 he was assigned to the General Staff and became a professor in the War Academy, lecturing there for seven years on applied tactics. In these lectures he gave much attention to the Masurian Lake region. He reached the rank of commanding general in 1903. In 1911, at the age of 64 he resigned because (according to his brother) a commanding general should in good time make room for younger men.

A study of Gen. von Hindenburg's career shows him to have been always a man absorbed in his profession, taking a serious view of his work, and preparing for whatever tasks the future might bring.

When Gen. von Hindenburg arrived in East Prussia Aug. 23, the Russian army of Wilna (Gen. Rennenkampf) had crossed the frontier near Eydtkuhnen and reached a point 30 miles east of Königsberg, where it intrenched. The Russian Narew army (Gen. Samsonoff) had advanced from the south via Mlawa and Soldau and occupied Allenstein. It then took up a position among the western Masurian Lakes.

Gen. von Hindenburg decided to attack the latter army on both flanks, a daring maneuver against superior numbers (3 to 1 according to Hindenburg himself). Gen. von Hindenburg concentrated most of his troops against the Narew Army, and was completely successful in his attack. Without pause, he then moved against the Wilna army, detaching a large force to swing around the Masurian lakes to get in rear of the Russian army. Gen Rennenkampf saw his danger and escaped with much less loss than did Gen. Samsonoff.

To stem the tide of Russian advance in Galicia, Gen. von Hindenburg now transported most of his troops to southeastern Silesia and by Sept. 28 had advanced into Russian Poland, supported by new Austrian forces assembled at Cracow.

The German military authorities failed to estimate properly the strength of the Russian forces. The Austrian offensive expended itself and left Gen. von Hindenburg to move against Warsaw alone. He was greatly outnumbered and his position became untenable. He then ordered his first retreat, and decided to fall back almost to the frontier. He turned upon the Russian forces following him and defeated one army corps at Wloclawek Nov. 14, and two others at Kutno Nov. 15. Lodz and Lowicz were occupied after hard fighting and the campaign ended in a deadlock along the Bzura, Rawka, and Nida rivers. Meanwhile the Russians had again advanced into East Prussia and had taken up a line east of the Masurian Lakes. Gen. Von Hindenburg now moved against this line as a surprise, covered by the weather and by an offensive in the Carpathians. Again the double flank attack was used, and notwithstanding very severe weather conditions the campaign was a complete success, and the number of prisoners taken in the "Winter's Battle" is unrivalled in history.

The story of Gen. von Hindenburg's campaigns is thus a story of a tremendous and unceasing offensive, and he makes heavy demands of his troops if necessary in carrying out his plans. Some of his troops marched 90 miles in four days during the battle of the Masurian Lakes.

First and foremost a soldier, Gen. von Hindenburg also takes an interest in art, and is proud of his lineage. He is a deeply religious man, as shown by his letters and occasionally by his orders. He has held aloof from politics but believes firmly in the justice of the cause of the Teutonic allies and has unshaken faith in their final success.

In his personal characteristics, he is simple and direct in all that he does; faithful to duty and country; unflagging in industry; and persistent in carrying out his plans. He consults his subordinates but makes his own decisions. From Professor Vogel, a portrait painter who spent two months at Gen. Von Hindenburg's headquarters, comes a description of the general's daily life. The surroundings are simple. Little call is made upon the many servants. Gen. von Hindenburg is a tremendous worker who finds time to do everything and is never nervous or impatient.

Six feet tall and of commanding figure, Gen. von Hindenburg satisfies in personal appearance the common ideal of what a great general should be.

WALNUT

See

AEROPLANES—MANUFACTURE OF

WAR

See also

PREPAREDNESS FOR WAR

—Aesthetics of

[The Aesthetics of War. By Francesco Masci, Capt. of Inf. *Riv. Mil. Italiana,* May, '15. 5000 words.]

The struggle in Europe has stirred the mind of the world, but with all its horrors, it has not failed to bring out the real beauty of war. Yesterday the world looked upon sacrifice and heroism as classic virtues found in ancient history, and all the poetic side of war, as regards the present day, was smothered under calculations of gigantic armaments, number of bayonets, caliber of cannon, thickness of armor, and power of explosives. Amid all the incidents of this war, it remained for a small people to show the true warlike spirit. The resistance and the sacrifices of the Belgian people are worthy to be remembered with the most heroic deeds of Sparta, Rome, and Carthage.

War is a culminating point in the historical curve of humanity. Battles, numbers, armaments, are only incidents; the essentials are the furrows ploughed in the life of the people and the ideas sown there to bring forth the crop of destiny.

The epic of the Japanese resistance to the Muscovite will endure forever. Likewise the superb but unsuccessful defense of the Boers showed the best spirit of war.

The soul of the German people is in the German army, but the animating force of the German soldier is the spirit of discipline rather than the spirit of poetry. It bears no germ of immortal song such as is inspired by the story of the Belgians. It would have been easy for the Belgians to save their lives, their territory, their property, and their works of art by yielding to superior force without resistance, but they would have lost their self-respect and doomed themselves to extinction. A weak and unwarlike people would have bowed their heads in submission, but the people of King Albert had too much vigor, too much depth of spirit, to submit tamely to inexorable fate. Without such virtues the aesthetics of war could not exist.

The disasters that overtook France in 1870 came from diplomatic, political, and military errors, and errors of pride and vanity. France was full of the tradition of glory and military virtue, but her leaders were lacking in energy and will-power. At Sedan the emperor offered himself as a prisoner at the head of about 150,000 sound men with more than 600 guns. Bazaine followed his example.

Many years after, General Stoessel, at Port Arthur, capitulated before the irresistible onslaught of the Japanese, after five months of bombardment, but he surrendered entirely too long a line of magnificent Siberian battalions to retain the admiration felt for him in the early days of the war.

Contrast this with the case of Pietro Tonelli, who, with only a thousand men facing a determined horde of Abyssinians, instead of retreating as he was advised to do bv friendly natives, preferred to sacrifice himself and his men. To the common mind this was folly, but it was a magnificent illustration of Italian spirit.

He was an aesthete.

—Benefits of

[The Other Side of the Shield. *Arms and the Man,* Sept. 23, '15. 400 words.]

Reports from the European war indicate that many men in the ranks are improving in health and physique. This is especially true of the city man. The same phenomenon was noticed in the Civil War; according to some observers, the great development of the West was due to the spirit of initiative and daring bred both North and South in the soldiers of the two armies.

See also

EDUCATION, MILITARY—ADVANTAGES OF

—Cost of

[Money Cost of a War. *Arms and the Man,* July, '15. 500 words. Tables.]

War is more expensive than it used to be. It was estimated ten years ago that a war in which France, Germany, Britain, and Austria should engage, would call for $18,000,000 per day. Another authority, of later date (1913) concluded that the actual expense of the actual campaign, if Germany, England, Russia, Italy, Austria and Rumania were all engaged, would reach nearly $55,000,000 per day, and gives a table showing the separate elements of this cost.

—Laws of

See also

EUROPEAN WAR—REPORTS OF ATROCITIES

—Losses in

[Casualties in Former Wars. Editorial. *Army & Navy Jour.,* Oct 9, '15. 700 words.]

In the battle of Zorndorf, Aug 25, 1758, between 42,000 Russians and 36,000 Prussians, the losses were 42.9% and 33.3% respectively. At Kunersdorf, Aug 12, 1759, 71,000 Russians and Austrians were defeated by 43,000 Prussians, with losses of 22.1% for the Allies and 43.4% for the Prussians.

In the "Battle of the Nations" (Leipzig, Oct 19, 1813) Napoleon with 171,000 defeated the Allies numbering 301,500. The allied losses were 48,000 (16.2%) and the French losses 45,000 (26.3%). At Aspern, May 21, 1809, the French losses were 46.8% of a force of 90,000 against 30% of an Austrian force of 75,000.

At Borodino, Sept 7, 1812, the French lost 18.4% of an army of 130,000 and the Russians loss was 31% of 121,000. The above figures are from Berndt "Die Zahl im Kriege," Vienna, 1897. The losses at Borodino have been otherwise variously estimated.

As a comparison between Gettysburg and Waterloo, Meade with 82,000 men and 300 guns lost 23,003; the Allied forces at Waterloo, 80,000 men and 252 guns, lost 23,185. The French losses at Waterloo, not accurately known, were about 26,300; the Confederate loss at Gettysburg 20,448 plus 7077 wounded and unwounded prisoners.

The heaviest casualties in the Franco-Prussian War were at Gravelotte, where the German loss was 20,577 out of 146,000 troops engaged. The Union Armies in the Civil War lost more men in six months following May 4, 1864, than the German armies lost in the entire Franco-Prussian War.

—Moral Forces in

[The Immaterial Forces of a Nation in War. By Maj. Gen. Sir J. K. Trotter, K.C.B., G.M.C., R. A. *Jour. Royal Artillery,* May, '15. 14,000 words.]

The forces brought into play in war are of two natures. The seen, which includes men, munitions, and other paraphernalia for carrying on war; and the unseen, that something which is behind all the animate forces of the material side of war. It is with the latter force that this article deals.

Moral force is admitted to have a preponderating effect in all operations of war. While material force is a main agency in bringing about decisive results, few great successes have been won by that alone. It is moral superiority that wins decisive victories.

The term "moral force" is used generally to express the influence that affects the action of troops in war, and which is not material. It is not a single force always acting in a particular way. But its effect is produced by a number of varied and complex forces, the act-

WAR—Continued

ion of one or more predominating at different times in the same or different persons to produce varying results. The moral force always acts through a physical frame.

These moral forces can be discussed best under two general headings.

(1) Those which come to a man through his military training and his life as a soldier.

(2) Those which are national in character.

A soldier enters the ranks with a certain coefficient of personal courage, nerve power, and moral vitality. Every man is differently equipped with the power to respond to the moral influences with which he is surrounded. During his military career certain agencies are available to increase his moral force, and upon the extent to which they influence him depends his power to face the serious demands of war. These agencies are: health, self control, discipline, training, tradition and *esprit de corps*, education, and inspiration of leaders. The neglect of health, self control, and education; and the absence of efficient training, of *esprit de corps*, of trust in leaders, will help to produce and strengthen the inclination which prompts men to avoid risk, to escape from danger, and to neglect duty. While the physical force applied by men in mass is less than the sum of the forces applied by each man individually, the moral force of men in mass is far beyond the sum of those developed by each individual man.

The influences on moral force in war which are national in character are the will, the needs, the hopes, the fears, and sometimes the despair of the nation. The strength of this force depends upon the moral condition of the nation, and upon the influence on its soul of the cause which calls the nation forth to war.

The moral force of the nation is measured by the standard of character of its citizens, the development of which is dependent upon the physical efficiency, the freedom, the education, the patriotism, and the religious fervor of the nation.

The mere existence of a high moral character in the nation is not of itself sufficient, the nation must be awake morally and must be ready for and willing to make the great sacrifices which war entails.

It is difficult to compare the effects of these two moral forces, since both types are found in greater or lesser volume in every army engaged in war. Military history shows us that the best weapon to strike a blow or to bear punishment is the professional army. But such an army has its own point of view about the war, and not being imbued necessarily with true national feeling, it looks more to reward for itself rather than to carrying out the national policies of the state. Furthermore such armies never have accomplished anything of permanent value to the state.

The conditions which produced the professional armies of ancient and mediaeval times have passed away and the modern army is essentially a national army composed of the entire manhood of the nation. Such an army is more influenced by the soul of the nation and just so far as it is so influenced and carries out the ambitions and policy of the nation, the more of permanent value to the nation is accomplished.

In the war of American Independence, 1775-1781; the Invasion of Russia by Napoleon, 1812; the Italian Wars of Regeneration, 1815-1870; The Franco-German War, 1870-71; and the Russo-Japanese War, 1904-05; we see national armies imbued with the moral forces of the nations pitted against and finally overcoming professional armies. And in the South African War, 1899-1902, it was only when the national spirit of Great Britain was fully and rudely awakened that the British armies began to make headway against the Boers. It is instructive to note the highly developed national spirit among the Balkan nations during the first stage of the Balkan War, and the entire absence of such spirit among the Bulgarians during the second stage when they were pursuing aims of a lower order and fighting over a division of the spoils.

While in order for a nation to be in a position to employ its moral forces in war, those forces must be awake and active, there are certain emergencies that will arouse and call forth the national spirit instantly, however feebly it may have been acting before. Such an emergency is the invasion of its territory.

The lesson that we learn is, that if a nation goes to war, it only can hope to bring the war to a successful conclusion when it is pursuing a national purpose that is supported by the soul of the nation, and when the moral forces of the nation are in such healthy and active conditions as to answer to the calls of duty and sacrifice. If in addition, its fighting forces are in highly efficient condition, the decision wll be obtained at a proportionately reduced cost.

The problem is how the moral force of the nation can be kept awake and active. The nation is always ready to accept sacrifice in time of emergency, but is unwilling so to do when no emergency exists. The only way to raise a new ideal in the nation is through the navy and army, by making the services the instructors and guides of the nation. The training of the soldier should foster his moral powers and teach him how his efficiency in peace and war is dependent upon the level to which he raises his moral standard.

The foundation for this moral training should be laid in the schools. Organizations such as the Boy Scouts are also splendid agencies in the process of keeping alive national moral force.

Upon his admission to the service, the young soldier must be so handled that he is inspired with a new ideal and does not drift aimlessly with the first eddy by which he happens to be caught. His physical welfare and the cultivation of will power should receive early attention. A standard of education is necessary to proper moral training. Each man should be impressed with the greatness of his calling. Truth, honor, chivalry, and *esprit de corps*, should be cultivated. In brief, the soldier must be taught that his life belongs to his

country, to be given up if needed but not to be thrown away recklessly; and when occasion arises he must face every risk unhesitatingly.

Similarly the officer must be trained and must so guide his life that he is fitted both professionally and morally to lead his men in time of war. Consequently the standard for his moral, physical, and educational training must be higher than that for the enlisted men. It is through the training of their officers that we must look for the development of the moral powers of the men.

But it is not alone the army who are responsible for success in war. The military authorities are charged with the conduct of war and with the preparation and training of the armed forces of the nation in so far as the funds authorized by the statesmen permit. But it is the statesman who determines when the time for war has arrived, who takes account of the relative forces at his disposal and the strength of soul which the nation is prepared to contribute to the war.

It is a common popular belief that advancing civilization renders a nation less fitted for war. This result, however, is not to be attributed to civilization but to neglect to accept the precepts which civilization teaches and to follow the path she shows to be right. Civilization properly understood renders a nation more fit to succeed in war.

The raising of the moral tone of all the nations will tend to diminish war, since the soul of a nation will not answer a summons which does not appeal to the people's sense of duty, of justice, and of right. It will be more difficult for nations to find occasions for fighting as the development of their moral forces progresses.

[Human Element in War. Reeve Memorial Prize Essay. By Maj. Gen. W. H. Carter, U. S. Army. *Jour. Military Service Inst.*, U. S., Sept-Oct '15. 6000 words.]

Military chronicles will always be projected upon the background of heartaches and disappointments. "Under any form of government, it is humanly impossible for the appointing power always to know and select for high office those best equipped and most deserving of public confidence." Cases must therefore occur where officers in the army may justly feel that proper recognition of their services has not been made, and back of these will be many other cases of individuals who have become possessed of an exaggerated idea of their services, of desire for power, of jealousy, of offended dignity, down through the whole gamut of human emotions. Illustrations are not lacking in our own history. Arnold's treason is attributable to disappointed ambition and lack of appreciation. Burr attributed his dismissal from Washington's headquarters to Alexander Hamilton, Washington himself was the object of a conspiracy, known as the Conway Cabal. Washington had a high conception of his own dignity, though free from vulgar ambition. He resigned on a point of rank between Crown and provincial officers. General Stark resigned because he was overslaughed, though in an emergency he later put aside his grievances. Gen. Morgan also resigned because of lack of merited recognition. Gen. Scott suffered serious grievances through political rivalry; those high in authority sought to humiliate him.

The Civil War was marked by bitterness and jealousy, even involving disparagement of honorable and patriotic officers. The order for the removal of Gen. Thomas from command was signed on the eve of the battle of Nashville, through faulty estimate of his ability. The victory served to rescind the order. Too late to remove the pangs of unappreciated merit, Gen. Grant wrote a high tribute to Thomas.

Hooker, persistent critic of others, complained of lack of support when given command. After the battle of Gettysburg, Meade, who relieved Hooker just before that battle, was severely condemned for allowing Lee to escape.

Meade's private letters show that he felt aggrieved by the assignment of Gen. Halleck over him. With a continuous good record with the Army of the Potomac, Meade was passed over in promotion by his junior, Sheridan.

The deplorable thing is that honorable men who have given throughout long years evidences of courage, soldierly ability, and patriotism are ruthlessly sacrificed for a single miscarriage or alleged luke-warmness in carrying out an order. Gen. Warren and Gen. Fitz John Porter are the most notable cases of this character.

Sometimes desire for promotion degenerates into frank and open effort to secure it, and a case is cited. The long period between the Civil War and the War with Spain had its full share of rivalries among those who accepted commissions with reduced rank and started afresh in search of further promotion.

A republic should demand that those elevated to military command shall possess military training, experience, and demonstrated ability. We should have better and more businesslike administration of army affairs in the future, and the avenues of entrance into and progress in the army should be strictly safeguarded. Up to the grade of colonel, there is little difficulty from rivalry. Beyond that point, an accumulated record of performance constitutes a better claim to preferment and command than personal and political friendships.

An officer may suffer from the rivalry, envy, and jealousy of other aspirants for power, but a steadfast adherence to the motto—Duty, Honor, Country—will render him proof against the shafts of calumny.

See also
MORALE
PSYCHOLOGY OF COMBAT

WATCHES

See
CHRONOGRAPH
SKETCHING—USE OF WATCH IN

WATER SUPPLY

—Field Water Bag

WATER SUPPLY—Continued

[New Army Water Bag. *Army & Navy Register*, June 12, '15. 250 words.]

This new bag seems to be a success, for the Quartermaster Corps has succeeded in making it watertight. It is made of 12-oz. canvas, khaki color, lined with pure Para rubber between the canvas and a cotton sheeting, the whole cemented into a solid piece by treatment. Filled to 40 gallons, it weighs 350 lbs., enough for the canteens of one company. Time only will show whether the bag is durable.

[A Field Water Bag. By Maj. W. J. L. Lyster, Medical Corps, U. S. A. *Infantry Jour.*, Apr-May 1915. 600 words, photo.]

The field water bag, designed for a company of infantry at war strength, is twenty inches by twenty-eight, of specially prepared canvas, sewn to a flat iron ring, hinged so as to fold on one diameter. Five faucets, with neck small enough to enter a canteen, are placed around the bottom edge. A canteen can be filled in ten seconds.

The bag empty weighs 7½ lbs.; filled 330 lbs. It is not for transporting water but to hold water for sterilization and distribution. A package of sixty sterilizing tubes measures 7½x3½x4½ inches and weighs ten ounces. Severe test conditions have demonstrated that the sterilizing agent is highly effective.

The appliance is portable, secures disinfection of the canteen, permits of supervision of the filling of the canteen, does not raise the temperature of the water, gives prompt service and is a tested, convenient, 100% efficient, method of sterilization.

—Sterilization—By Calcium Hypochlorite

[Sterilization of Drinking Water by Calcium Hypochlorite in the Field. By Maj. W. J. Lyster, Med. Corps, U. S. Army. *Military Surgeon*, Mar 1915. 2000 words.]

Efforts have been directed toward finding some practical appliance for or method of sterilizing drinking water for troops in the field. Boiling is effective, but when troops are thirsty, men will not wait for water to boil and then cool. Sterilizers and filters are effective, but too bulky to be carried. Any device to be effective must be ready for use and close to the soldier.

Experiments have been conducted with hypochlorite of calcium as a means of rendering drinking water potable. The means devised consists of a canvas water bag, the calcium hypochlorite being carried in glass tubes. Enough of the latter to sterilize the water for a war-strength company of infantry for 12 days forms a small package weighing 10 oz. The sterilization is effective, does not raise the temperature of the water, and disinfects the canteen.

WIND

—Effect of on Projectile

See

BALLISTICS—EFFECT OF WIND

WINSLOW, Brig. Gen. E. F. (U. S. A.)

[Forgotten Cavalrymen. By J. H. W. *Jour. U. S. Cavalry Assn.*, Jan, '15. 5000 words.]

An account of the life and services of Brig. Gen. E. F. Winslow, U. S. Vols.

WINTER CAMPAIGNING

[The Difficulties of a Winter Campaign. By Sir John French's Dispatch of Feb. 12. *The Sphere*, Mar 13, 1915.]

Winter weather conditions operate to prevent the accurate and constant observation necessary to make long range artillery fire effective, as well as to hinder aerial reconnaisance upon which reliance is now placed for information of the enemy. Under modern rifle and machine gun fire, the difficulty of making an attack is greatly increased due to the difficulty of emerging from a muddy and slippery trench and advancing over a muddy foreground.

WIRE, Barbed

See

BARBED WIRE

WIRELESS TELEGRAPHY

[Variations of Intensity of Radiotelegraphic Transmissions. *Memorial de Ingenieros* (Madrid), Aug., '15. 300 words.]

Since Marconi, in 1902, called attention to the differences of intensity between day and night signals by wireless, numerous investigations have been made of this phenomenon, and various theories have been propounded. Professor E. W. Merchant, in February last, presented to the Institute of Electric Engineers of London some results of his studies between the Paris, Liverpool, and Brussels stations, as to: 1st, the effect of different atmospheric conditions; 2d, variations of intensity observed at sunset; and 3rd, fluctuations during night work.

His results may be summarized as follows:

(a) During the day, between stations on a northwest-southeast line, the intensity varies between closely defined limits.

(b) The relation between the intensity of day and night signals varies with the months of the year and with the days of each month.

(c) On a clear day the effect of sunset is noted approximately three-quarters of an hour afterwards, and varies with the atmospheric condition. On a rainy day the increased intensity after sunset is much less than in clear weather.

(d) The effect of sunset varies with the direction of the transmission.

(e) The variations of intensity during the night are relatively great and may be noticed in a few minutes. The greatest changes have been noted on the cessation of rain either at a sending or receiving station.

(f) It is supposed that the principal cause of the variations of intensity is the state of "ionization" of the atmosphere; that, in the higher strata of air, there are "ionized clouds" which act as reflectors of the electro-magnetic waves; and that the motion of these "clouds" throws the reflection irregularly in different directions.

—Aeronautical

See

AERONAUTICS—USE OF WIRELESS IN

—Apparatus and Equipment—Portable

[Moving Stations of the Wireless Telegraph Corps. *Memorial de Ingenieros del Ejército*, May, '15. 300 words. Photos.]

A rolling wireless station, of 300 kilometers radius of communication, is now in use in the Spanish Army. Its mobility is that of field artillery and it can be dismantled and ready to move in one-half an hour. The same time is required to set it up and get into communication.

In construction and operation it is of the simplest nature, and does not depend on constant attention from skilled mechanicians.

Due to the rough terrain and poor roads of Spain the construction of the apparatus is necessarily such that it cannot easily be disabled.

Certain of the wireless stations recently in use in Africa have proved to be of too light and delicate construction to be serviceable under field conditions, and in this new apparatus these features are eliminated.

Twelve essential conditions are fulfilled: 1st, Mobility equal to field artillery; 2d, A maximum radius of communication; 3d, Quick change of wave length; 4th, A quick adjustment to "pitch" or "tone"; 5th, Quick mounting for transportation; 6th, Possibility of utilization on all kinds of terrain; 7th, No damage to the most delicate parts in transportation; 8th, All coverings of such character as to protect the motor and other parts from the weather and at the same time facilitate inspection; 9th, Parts of the antennae masts interchangeable and easily replaced: 10th, Supply of fuel, oil, and water for fifteen days; 11th, Repair facilities for all parts; 12th, Camp necessities and conveniences for the personnel.

(A detailed description of the parts of the station follows.)

[Note.—*Army & Navy Jour.*, June 12, '15. 100 words.]

The latest type of wireless apparatus is designed for use at division headquarters. The outfit weighs about 5000 lbs., is carried on a commercial type of ¾-ton truck chassis, and has a crew of two chauffeurs, two messengers, and one n.c.o. in charge. Under all conditions it can send 100 miles and under favorable conditions can be operated at a distance of 150 miles.

[Note *Army and Navy Jour.*, Sept. 11, '15. 75 words.]

The new field wireless apparatus sent a message at a distance of 44 miles on Sept. 3 at Fort Leavenworth, Kansas. It can be packed on one mule.

[Army Radio Tractor. *Army & Navy Register*, Sept 25. '15. 400 words. Illustrations.]

The Army radio tractor set No. 2, built by the Signal Corps is in use and giving good results. Still another type is the so-called "division type," intended to accompany division headquarters in the field. It is lighter and faster than set No. 2; and consists of a special body built on a ¾-ton truck chassis. Electrically the equipment consists of a 1 k.w. alternating dynamo gearing at will with the automobile engine; a portable switchboard is installed back of the driver's seat and on top of the body is a mast-hoisting shears, folded down on the road. There is besides a powerful electric signal lamp on top, which may be used for signalling. Complete, the set weighs 5000 lbs.; the crew consists of two chauffeurs, two operators, two messengers, and one n.c.o., sufficient to put up the 60-foot mast etc., in about 5 minutes. Under ordinary conditions the range is 100, under favorable 150 miles.

—"Ferrotype" Receiving Plates

[Radiographic Tests on Ferrotype Plates. *Memorial de Ingenieros del Ejército*, April, '15. 150 words.]

A new method has been perfected in France of receiving radiograms, and is described in a report to the Academy of Sciences of Paris by M. Landouze. It consists of the use of sensitive metallic plates for photographing the wave action. These plates, known as "ferrotypes," give positive pictures directly; and a current in the tubes of about seven amperes at seventy volts gives the strength required for the plate.

The means employed are much less dangerous to the operators than those heretofore employed in sending and receiving, and the exposure of the plate varies from six to sixty seconds. Ten minutes only are required to obtain a finished positive plate.

—Instruction and Training

[School of Radiotelegraphy of the Army—Editorial. *Rev. Militar* (Argentine). June, '15, 800 words.]

The candidates for the radiotelegraph corps are to be assembled at the maneuvers in September for a three months' course of instruction. The object of the course is to prepare the candidates as skillful operators and disciplined soldiers hardened to fatigue.

The instruction will include athletics; military regulations; shooting and open order; field service; knowledge of all the instruments and other features of a wireless station; transmitting and receiving messages, up to twenty words a minute; maneuvers, setting up and taking down the station; telephone patrols; signalling with the arms; hygiene and first aid; how to treat injuries due to the electric current or the motors; reserves and mobilization; tactical and technical themes; upkeep and repair of the clothing, arms and equipment; reviews. 42 hours a week will be devoted to instruction, and a total of 546 hours during the course.

[Transportable Military Radio Set. *Army & Navy Register*, June 12, '15. 175 words.]

An army radio tractor set, built by the Signal Corps, is in use and gives satisfaction. The mica conductor in the transmitter attracts attention. A later type of radio tractor has been designed and built as part of the radio equipment of aviation.

WIRE-WOUND GUNS
See
ARTILLERY—WIRE-WOUND GUNS

WIRES, Electric
See
ELECTRIC WIRES

WOUNDED
See also
WOUNDS

—Transportation of
See
SANITARY SERVICE—TRANSPORTATION OF SICK AND WOUNDED

WOUNDS

[Doctor Fauntleroy's Views of the War. *Arms and the Man,* Nov. 4, '15. 500 words.]

Surgeon Fauntleroy, U. S. N., sent to France last April as a representative of the Medical Department of the Navy, reports 98 per cent of the wounds treated in hospital as caused by bursting shell. Rifle wounds when they do occur, are usually in the head. Hand grenades have to a surprising extent taken the place of the bayonet in charges. Although the bayonet is far more dreaded than either shell or rifle fire, the grenade seems to be surer and more expeditious.

See also
EUROPEAN WAR—WOUNDED
SURGERY, MILITARY

—Treatment of

[Preliminary Report of a Committee appointed by the Director General of the Navy in December, 1914, to inquire into the best methods of treating wounds. Sir Watson Cheyne, Fleet Surgeon P. W. Bassett, and Mr. Arthur Edmunds. *Jour. of the Royal Naval Medical Service,* Apr., '15. 15,000 words. Illustrated.]

Reports experiments made with slowly soluble antiseptics in freshly made wounds containing tetanus and other germs. Reports investigations that promise to give excellent results for first-aid packets at the front, so as t prevent sepsis until proper care can be given, perhaps some hours later.

X-RAY TECHNIQUE

[Progress in X-Ray Technique in the Army. By Friedrich Dessauer. *Kriegs. Zeitschrift,* Mar-Apr, '15. 3000 words. 5 photo prints.]

At the beginning of the present war, most of the larger base hospitals were equipped with Roentgen-ray apparatus. It was invaluable in the location of fragments, and this use was clearly foreseen. However, the apparatus took on a new significance. It was found that the use of X-rays greatly facilitated the classification of wounded. This problem requires great skill, must be rapidly solved, and the efficient handling of the wounded is due to the fact that it is solved, and solved well. The Roentgen apparatus makes a quick classification possible.

The examination of each case by X-ray can be performed in even less than a minute. Previously, the work of setting up and adjusting the apparatus alone was the work of hours. Now it is done in a very short time.

One especially new problem, however, has been the question of bringing the apparatus up to the foremost dressing stations. The earlier the classification of wounded takes place, the less frequent will be the moving and removing of them. At first, light vehicles were used for transporting the machine, but later automobiles were adapted, not only for accommodation of the apparatus, but the engine was used at the same time to furnish electric current for its operation.

The modification of the automobile was a small affair as compared to the problem of protecting the apparatus from injury due to rough handling and weather. It was a simple matter to devise a clutch which would throw the motor from the transmission to the dynamo. The tonneau was built into a box-like house containing room for the apparatus and accessories and a dark room for the development of negatives. It may be added, however, that very few cases require the making of a negative, and even in these cases the exposure has been cut down to from 10 to 20 seconds.

The Roentgen apparatus had to be entirely rebuilt on lines that would render it less fragile. It is built into a strong wooden box which is withdrawn from the body of the machine upon arrival at the dressing station. Necessarily a large number of spare parts must be provided. One secret, too, of its success has been the fact that each machine is accompanied by a Roentgen expert who has direct charge and control of its operation.

Some of the machines have also an operating table lighted by electricity. This has done great service since so many of the heavy casualties have occurred in night attacks.

[X-Rays: Samaritans of War. By A. M. Jungmann. *World's Advance,* Nov. '15. 1300 words. Illustrated.]

Although all the larger permanent hospitals are equipped with X-ray apparatus, it is impossible to so equip all the smaller hospitals. To meet the need of these smaller hospitals, a traveling motor X-ray apparatus has been devised, which makes regular visits at specific dates and hours. X-ray photos of the patient are hung beside his chart.

Infection of wounds is difficult to prevent, due to the unsanitary conditions incident to present war methods. An instance is cited of a French soldier brought to a base hospital in November, 1914, who stated that he had not had a change of clothing since the war began.

The small bullet produces shattering breaks of the larger bones. The worst wounds to deal with are those made by the ragged fragments of shell and shrapnel, since these almost certainly carry bits of soiled clothing into the wounds and produce infection. Leg wounds are worse to deal with than arm wounds, and more frequently result in amputation because of infection.

The dental surgeon has done miracles in treatment of facial wounds. In this work, the X-ray has been of the greatest assistance. Hospital ships are also equipped with X-ray. It is the surgeon's most trustworthy and able assistant.

ZEPPELINS
See
DIRIGIBLES—GERMANY